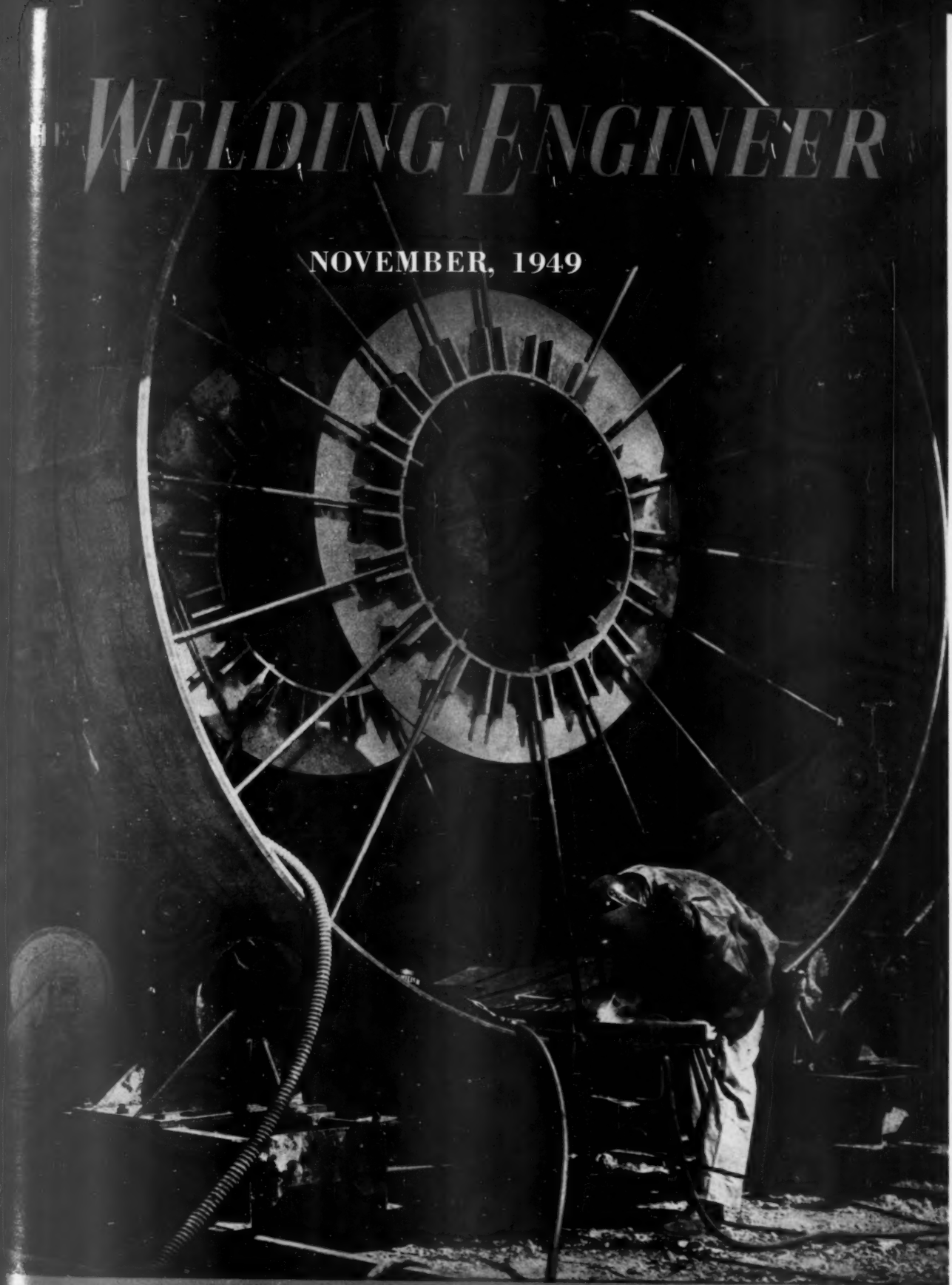
WELDING ENGINEER

NOVEMBER, 1949



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Volume 34 - Number 11 November, 1949

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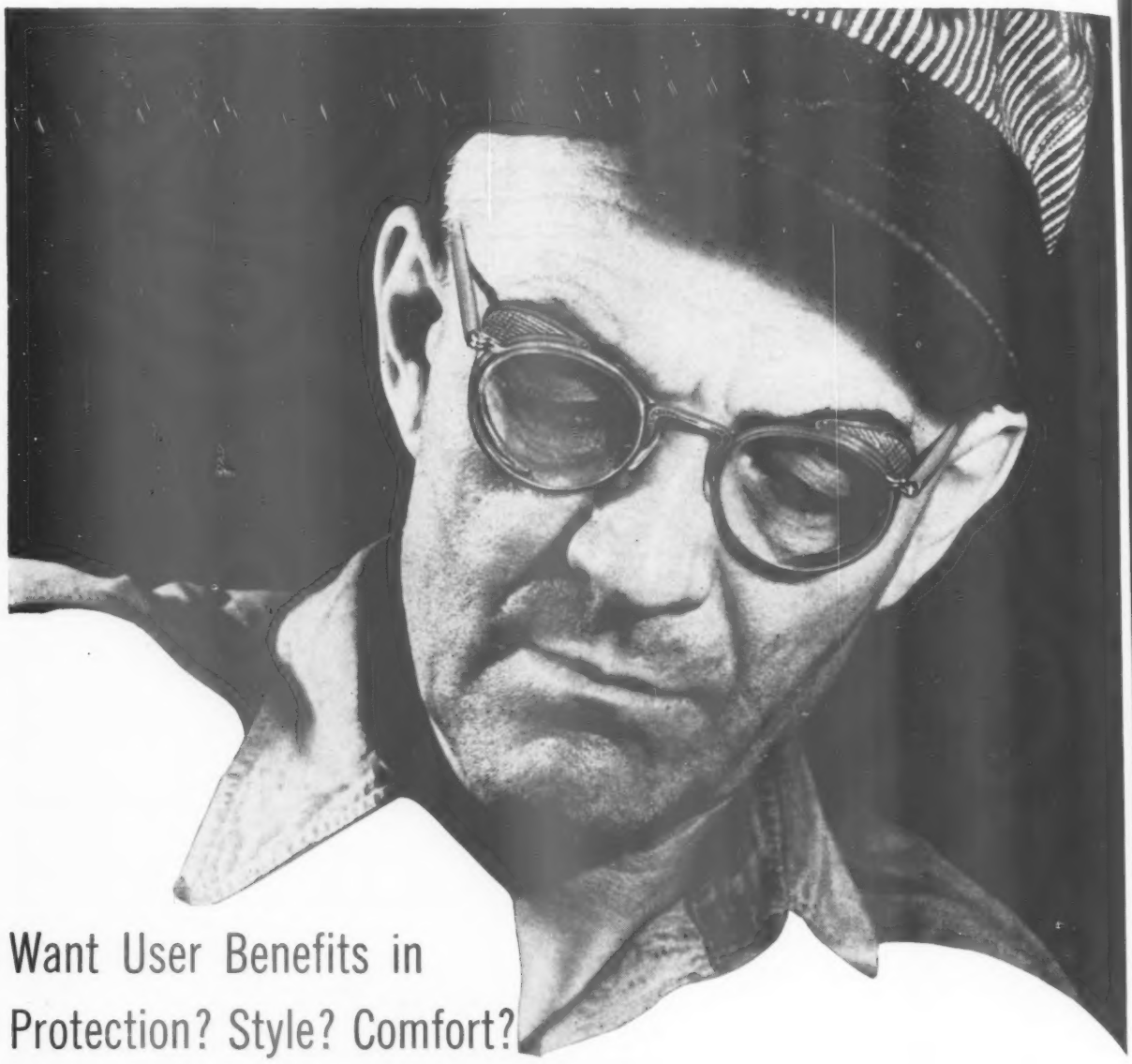

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THE WELDING ENGINEER

NOVEMBER, 1949

Is It Wrong to Be Big?

LOOK AT ENGLAND today if you want to see what a tight governmental rein on business can do to a country's economy. In just a few short years, a socialized group of leaders has successfully accomplished the task at which Hitler failed. Without firing a shot, they have brought a proud people to their knees, reduced a great empire to the status of a third-rate power.

It can't happen here, we complacently delude ourselves, but it can, it may. Even with this horrible example of how to wreck a nation before them, our present national leaders continue to toy with similar ideas. They seem to be playing with socialism like the moth with the flame, trying to see how close they can fly to it without getting their wings singed. It's a dangerous sport —most dangerous to those of us who don't have much to do with government but a great deal to do with industry.

The very worst is that we cannot turn back upon this one-way street.

Latest examples of socialistic governmental meddling with business are to be found in the antitrust actions instituted against du Pont, General Motors, U. S. Rubber and the A & P stores. If these suits were brought because of violations of the Sherman Act, as is alleged, they should have been brought long ago. That act was enacted 59 years ago, and all of the firms now embroiled with antitrust actions have operated during much of the intervening period the same as they are operating today.

The only thing against them seems to be that they have grown too big. Is it wrong to be big? Our federal government, the biggest thing of its kind that the world has ever seen, appears to think so.

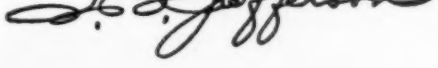
Most of us see nothing wrong with bigness if big business is operated efficiently, honestly and progressively. A few men in key governmental positions apparently think that bigness is wrong in itself. Why? What are they aiming at? It might be healthier for the country if they came out from behind their stalking-horses.

These latest yammerings remind us of how the little people of Lilliput attacked the sleeping Gulliver merely because he was big. Gulliver escaped the chains of the Lilliputians after a series of remarkable adventures. Will big businesses be able to fare so well? Even if they are able to prove beyond a shadow of doubt that they are not monopolistic, dangerous or undesirable?

You may be inclined to say that these attacks against "big business" are no concern of yours, but that's like being indifferent to the burning of your neighbor's house even as the sparks are about to set your own roof on fire. They are of concern to every last one of us, both directly and indirectly. If the suit against the A & P chain is successful, for example, it is going to mean higher food prices for everyone, chain store customer or not.

Who else besides du Pont would have spent the millions necessary in research to give us not only hose for our wives but nylon for cloth and shroud lines for parachutes when our silk supplies vanished? This same du Pont has also given us cellophane, duco paints, better gun powder and thousands of other products for better living. Do you want the government to break it up?

A business becomes big because it gives people what they want at the lowest possible prices—all big business follows that pattern. Yet bigness should be eliminated! Apparently, these cockeyed logicians of the government want the people of the United States to have inferior products at higher prices. And if they are successful, we will get just that; England has shown us how.



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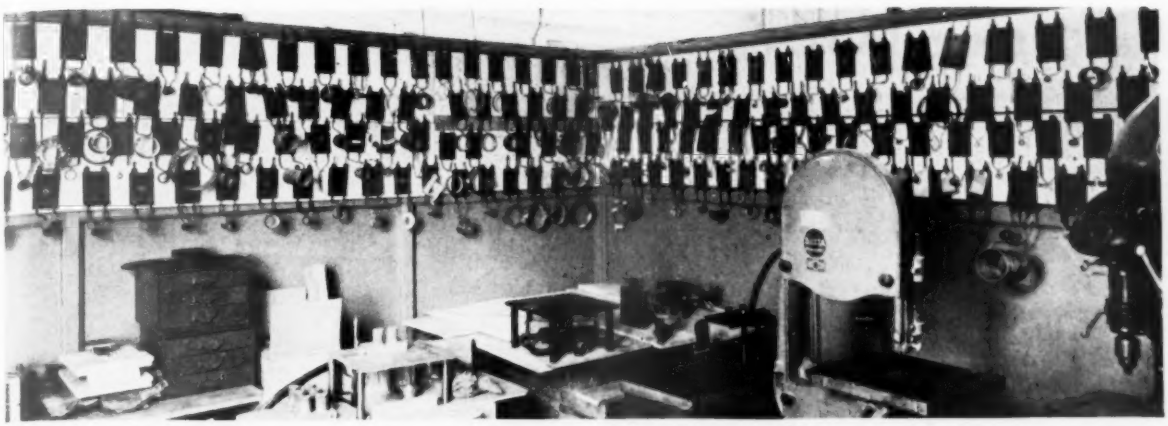


1—COILS ARE MADE in wide variety to suit different types of jobs. The Miller-Robinson Company keeps on hand nearly 1,000 single and multiple coils ranging in diameter from ⅛ to 12 in. Most are made from copper tubing

INDUCTION *Brazing and Hardening*

Miller-Robinson, Los Angeles, has seven different units of the motor-generator, spark-gap and electronic-oscillator types to provide a wide range of frequencies

BY FRED M. BURT

IN THE PLANT of the Miller-Robinson Co., Los Angeles, a full complement of equipment provides a complete high-frequency induction heating service for customers. This modern method of heat treatment is under the direction of Vice-President L. F. Miller, a registered electrical and mechanical engineer with wide experience in oil field equipment and instrument design. The seasoned background of the company's technicians enables them to branch into the varied fields of precision machining, instrument and equipment design and construction, heat treating and the development of electrical and electronic products.

Plant Expanded

The Miller-Robinson plant was recently more than doubled in size (now 8,500 sq ft). The new addition, operated under supervision of Vice-President James W. Robinson, produces a full line of pneumatic pruning equipment. This involves considerable silver brazing in the manufacture of subassemblies. Another product is air compressors, which require various weldments.

As high-frequency induction heating methods differ so radically from conventional heating processes, a brief explanation of the principle involved may be pertinent. High-frequency alternating current (10,000 to 5,000,000 cycles per second) is generated in a converter or oscillator. The current is carried around the workpiece through a water-cooled coil of copper tubing having one or more turns. The "shorted turn" principle sets up the heating resistance; the current squared times the resistance equals the wattage applied to the workpiece.

The size and shape of the coil is such that it surrounds only the area to be heated but does not touch the work. The coil acts as an inductor to set up a high magnetic field in the section of the work localized within the influence of the coil. Instantaneous heating of the work surface results from magnetic molecular friction and circulating electrical currents. The heating effect is concentrated on the surface of the work and progresses inwardly by conduction only. Thus the temperature and depth of penetration of heat can be controlled accurately by the timing and manner of application. Any metal that will harden upon heating and quenching can be hardened by high-frequency induction heating, and either ferrous or non-ferrous metals can be so heated.

Types of Equipment

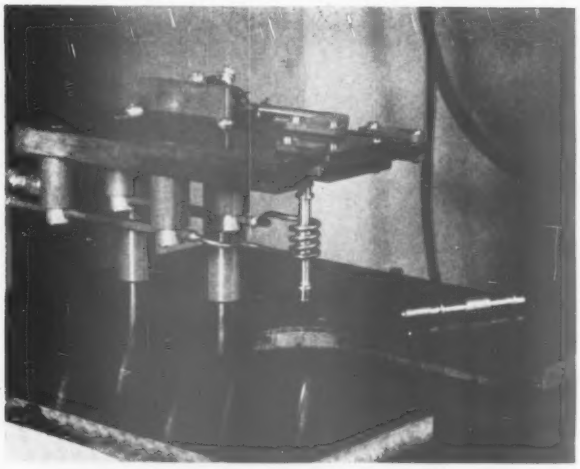
In this plant, there are three different types of equipment for converting the city light current of 60 cycles a-c and 220 volts to high frequency and high voltage current. These are:

(1) A 15-kw, 9,600-cycle motor generator. This is used for the lowest range of high-frequency current.

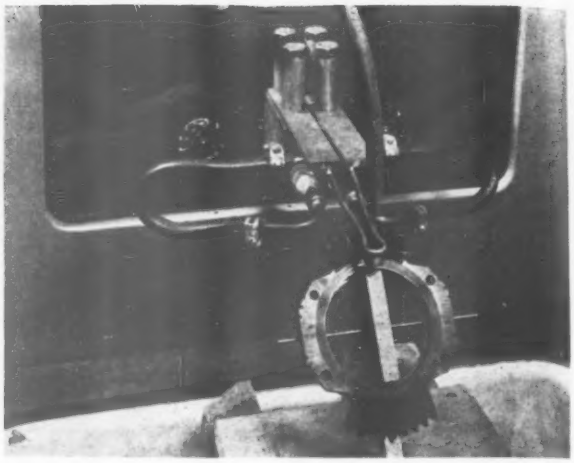
(2) Spark-gap generators of 7½, 15 and 30 kw. These three units first change the city current to 15,000 volts and then, by means of spark gaps and a resonant circuit, convert the high-voltage current to a frequency of, say, 300,000 cycles. The frequency is a variable as it may be higher or lower than 300,000 cycles over about a 200,000-cycle range. This wide range permits the frequency to be set to suit the coils used on each specific job in respect to the design and number of turns.

(3) Latest is the vacuum-tube method of electronic generation of high-frequency current. Miller-Robinson uses three vacuum-tube units of 1, 2, and 20 kw. The city current is stepped up to 4,000 to 12,000 volts, depending on the equipment size, and converted to any desired number of

Hardening Jobs



3—WORM GEAR BLANK of 440 stainless steel is heated by a current of 350 kilocycles and then dropped into the quenching tank below in order to harden it



4—AIRCRAFT CONTROL GEAR must have each tooth individually hardened. It takes 0.6 seconds per tooth with 500-kc current provided by vacuum-tube oscillator

2—SPINDLE SHAFT for a drill rod is hardened for full length by continuous heating with 450 kc and quenching with a water spray

cycles with a vacuum-tube oscillator.

In general, the first or low-frequency method is best for deep heating applications such as forging, silver brazing, specialized copper brazing and forming. The spark-gap method, used most frequently, is a good all-around method for localized heating and silver brazing. It provides the best flexibility because of the ease and speed of making setups. The vacuum-tube method, which covers the widest frequency range of all, takes a longer time to make a proper set-up and is thus more advantageous on production runs. It is used principally for localized heat treating and silver brazing.

Nearly 1,000 Coils

Inductor coils (Fig. 1) are formed to fit exactly to the designated area or areas of parts of any shape without affecting adjoining sections. The company has nearly 1,000 induction heating coils, single and multiple, ranging in diameter from ⅛ to 12 in. For the most part, these coils are made of ⅛ and 3/16 in. copper tubing.

As explained by Mr. Miller, heat induced by the high-frequency current is concentrated on the outer surface of the metal part being treated. The depth of penetration decreases and heating becomes more localized as the frequency increases. In surface hardening, this skin effect presents definite advantages. The depth of case best suited to the particular part being hardened can be obtained with exactness and uniformity through careful determining and setting of the control factors involved. The heating fixture can incorporate a water spray quench (Fig. 2) or can be mounted over an oil or water quench tank (Fig. 3).

In planning an induction hardening job, consideration is first given to the type of steel to be hardened, the depth of case required and the extent of area to be treated. Power, time cycle and quenching procedure are then determined, and inductor coils and fixtures are designed for the particular job. In a run of parts, the records kept anent all of these factors provide information that insures a comparable uniformity in running subsequent batches on the same unit. Checks of surface hardness and of depth of case are made from test samples as often as is needed to assure adherence to the specifications.

Only Surface Is Hardened

Surface hardening by high-frequency induction heating resembles flame-hardening in that it produces the maximum hardness obtainable in the material without alteration to the core structure. Full hardness is maintained throughout about 80% of the depth of the hardened zone and diminishes through a narrow transition zone to the core.

Unlike furnace hardening, in which the heat penetrates the entire body of metal, high-frequency heating takes place instantly and on the outer surface only. The part is quenched before heat can penetrate to the core, eliminating any need for the conventional drawing operation with its consequent reduction of surface hardness.

5—FRONT AXLE shaft of motor scooter is being silver brazed to axle bracket. An internal coil is used, and heating is carried on for two minutes at 350 kc

6—SMALL PINIONS are silver brazed to gears in 15 seconds, using an external coil and a current of 350-kc frequency. Special fixture facilitates the work

An example of the localized heating of a worm gear blank of 440 stainless is shown in Fig. 3; heating was done for 13 seconds with a current of 350 kilocycles before the part was dropped into the quenching tank.

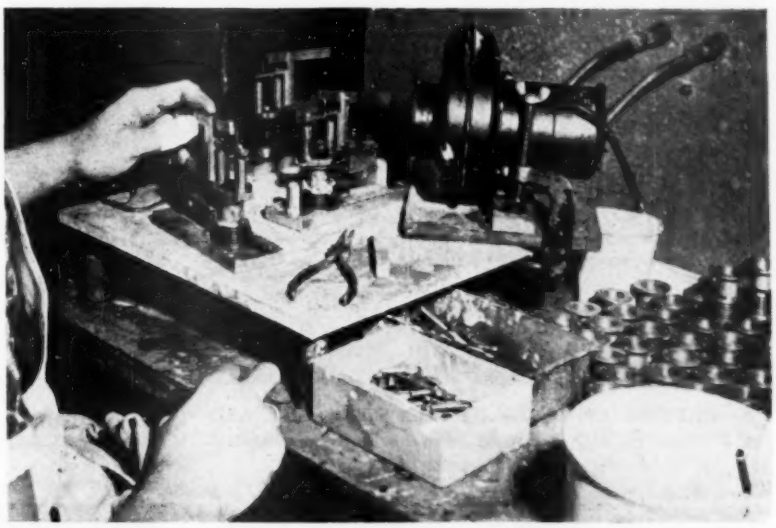
Hardened in 0.6 Seconds

Irregular parts such as cams, levers and gears or shafts with multiple diameters can be hardened on selected surfaces with results as uniform as though the shapes were symmetrical. The aircraft control gear shown in Fig. 4 has each tooth individually hardened in 0.6 seconds to a 1/32-in. depth with a 500-kc current. Temperature attained is about 1,550 F. Since the heating on such applications is performed in a matter of seconds, oxidation and scale formation are generally so minimized that even close-fitted surfaces will not require subsequent finishing or machining operations. With the shallow, quick heat penetration, warping or distortion is either avoided entirely or becomes negligible.

By employing plain-carbon or low-alloy steels of sufficient carbon content to produce the required surface hardness, the use of more expensive alloy steels can often be discontinued.

Induction Brazing

Brazing and soldering, using brazing alloys and solders in a range from the highest to lowest melting points, can often be done with greater speed and better results by high-frequency induction heating. Since the heat is generated within the metal itself and can be precisely controlled, the brazing alloy or solder penetrates throughout the joint or seam without scale formation, discoloration or excess metal of any consequence. Joints are uniform in a production run because of the repetition of the identical time-current characteristics. In silver brazing as in induction heat treatment, parts can have final machining done to precision tolerances before the induction heat is applied. In most cases, no subsequent heat treatment is necessary for grain refinement and there are no distortions.



7—SILVER BRAZING two exhaust stacks to cylinder of miniature aircraft engine. This job takes an internal coil with a current of 350 kc

Because no grain growth occurs in the workpiece, two pieces of chrome-moly steel that had been heat-treated to a tensile strength range of 90,000-100,000 psi were left unchanged in tensile strength after brazing. Induction silver brazing has been done in the Miller-Robinson plant to a 100,000 psi tensile strength as revealed by actual test; ordinarily,

(*Continued on page 22*)

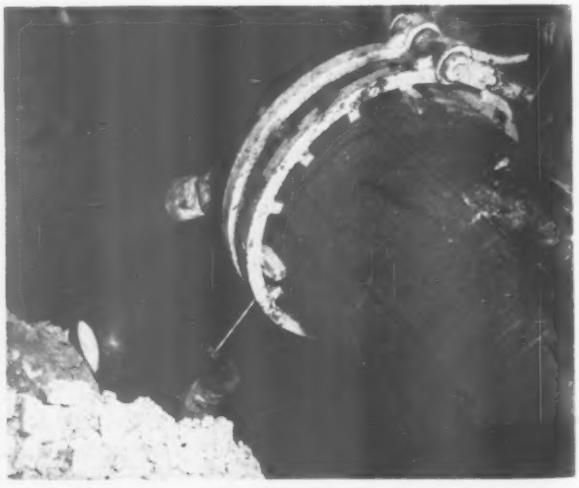
1—CRAWLER-TYPE tractors equipped with booms swing 40-ft lengths of pipe into alignment for welding

2—LINE-UP CLAMPS hold the alignment while the first bead is deposited on both sides simultaneously

3—PUTTING ON the second bead. This bead is with a 5/32-in. E-7010 electrode. First bead was an E-6010

4—THIRD AND FINAL bead is now being laid with 3/16-in. E-6010 electrode to seal the pipes together

5—OVERHEAD WELDING is required on each joint since the pipe cannot be rolled to position the welds



6—VERTICAL WELDING must be done, too. Weldors sometimes have to get into difficult places to work

865-Mile Pipe Line

Construction crews are now simultaneously working eight spreads to complete a natural gas line in the Big-Inch class, which will run from the Texas and Louisiana gas fields to Middletown, Ohio

BY T. B. JEFFERSON

TEXAS GAS TRANSMISSION Corp., Owensboro, Ky., recently started construction of 865 miles of natural gas pipe line stretching from the gas fields of Texas and Louisiana through the Mississippi and Ohio river valleys in order to connect with the "Big-Inch" pipe-line system at Middletown, O. These 865 miles will include 110 miles of 20-in. line from the Carthage gas fields to Lisbon, La., and 723 miles of 26-in. line from Lisbon to Middletown. In addition, a 32-mile lateral line of 12¾ in. pipe is to run from Madisonville, Ky., to Evansville, Ind.

2,000 MEN EMPLOYED

South of Memphis, Tenn., 63 miles of line had been completed and was in operation at the present writing. Construction crews are simultaneously working eight "spreads" along the remaining 800 miles of line, to be completed next spring, laying over 100 miles of pipe per month. This huge piping project will cost $73,500,000, which includes over $48,000,000 for construction of the pipe line and some $16,000,000 that will be invested in ten compressor stations having a total of 68,800 hp.

This huge project, which ranks among the largest of those involving pipe-line construction, will require the services of around 2,000 men. There are 17 rivers to be crossed as well as numerous railroad tracks, highways and swamps.

The magnitude of the job can better be appreciated when you realize that it will be necessary to buy 175,000 tons of steel pipes, 60,000 gallons of primer (the first coat for the pipe) and 17,000 tons of enamel to protect the pipe from corrosion once it has been laid in the ground.

While the operating procedure along the line is more or less standard, the welding details are of interest. The line, of course, is as all-welded as it is possible for a pipe line to be. Other than the necessary breaks left for expansion joints, there is one continuous tube.

Our primary interest is in the 26-in. pipe, which has a wall thickness of 5/16 in. and is delivered in 40-ft lengths. Simple arithmetic shows that there must be at least 132 welded joints per mile or, in the 865 miles of pipe line, 114,180 welds as a minimum. Actually, there will be more.

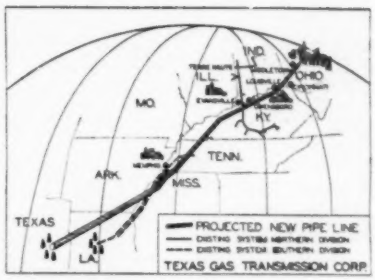
After the right-of-way has been surveyed, prepared and ditched, several crawler-type tractors equipped with side booms move into position to swing the 40-ft lengths of pipe into alignment for welding (Fig. 1).

As the pipe goes into position, alignment clamps are moved into place to hold it firmly during the first weld bead. The pipe is then lowered onto blocks: the clamp is removed, and the tractor goes on. Another crew of weldors moves in to deposit the stringer beads and the finished weld beads. After these welding operations have been completed, the pipe is coated and machine wrapped. It is then lowered into the ditch and covered with fill.

CLEAN ENDS FOR WELDING

The 26-in. diameter pipe is furnished with beveled ends suitable for welding. Sometimes, of course, it is necessary to flame-cut bevels in the field; when this is done the flame-cut surfaces are cleaned thoroughly to free them of scale. Likewise, the factory-prepared surfaces are thoroughly cleaned of rust, scale, dirt and other foreign matter that might adversely affect the welding operation. Finally, the completed weld must be cleaned of scale, slag and globules of spatter.

Each joint is held in alignment by a line-up clamp (Fig. 2) while the initial weld bead is applied. This bead is deposited completely around the pipe, starting from top center and proceeding to bottom center. As is shown in Fig. 2, two weldors work simultaneously on the opposite sides of the pipe. The line-up clamp is retained until a continuous weld bead equal to one-quarter the circumference of the pipe has been completed on each side; *i. e.*, the top half is welded. Upon removal of the clamp, the bottom half of the first weld bead is completed, and the weldors move onto the next joint to deposit another initial bead.



MAP SHOWS artist's conception of new natural gas pipe line from the Carthage field, Texas, to Ohio

ELECTRODE SIZES

Three-bead welding is being employed on the 5/16-in. wall pipe. The root bead is deposited with a 5/32-in. E-6010 electrode. The second bead is laid with a 5/32-in. E-7010 electrode, while the finished bead is deposited with a 3/16-in. E-6010. Where more interpass beads are required, they are deposited with 5/32-in. E-7010 electrodes. Care is taken to see that the finished bead has a minimum width of ½ in. and a reinforcement equal to at least 10% of the pipe wall thickness.

Extreme care must be exercised in depositing the weld metal to see that it is thoroughly fused to the pipe metal and is free from pinholes, cold shuts, oxide inclusions, rivers or other defects. For cleaning the beads, the hand chipping hammer has proved to be an effective tool. Wire brushing alone will not do the job, in the opinion of the pipe-line inspectors.

Fig. 3 shows the manner in which the second bead is deposited, and Fig. 4 shows a weldor engaged in depositing the finished bead. Since

7—MACHINERY BREAKS DOWN sometimes under hard labor of pipe-line construction. This weldor is replacing a hook on a road-tunneling machine

all of the pipe is welded in position instead of being rolled (as may be done on smaller-diameter lines), downhand, vertical and overhead welding are required on each joint. Examples of the conditions under which weldors must work are pictured in Figs. 5 and 6.

At various points along the line, it is necessary to reinforce the pipe by welding on steel sleeves. These sleeves are centered over the circumferential weld and fitted firmly to the walls of the pipe. Where it is necessary to obtain a proper fitting, a clamp is used to draw the sleeve tightly against the pipe wall. The longitudinal joints of the sleeve are welded in at least three beads and built up so that there will be minimum reinforcement of 1/16 in. above the wall of the sleeve. After the large joint has been welded, the sleeve is joined to the pipe by a fillet weld having a minimum of three beads.

Maintenance Work, Too

The welding of pipe is not the only job that confronts the weldor on such a pipe-line contract as this long line. Machinery breaks down under the hard work of pipe-line construction, and there are continued items to be built to ease the construction operations. Fig. 7 pictures a weldor replacing a hook on a road tunneling machine—just one of many examples of maintenance welding. There are also booms to be repaired, bulldozer blades to be reinforced and hundreds of other maintenance jobs. Without welding, it would be impossible to build in such a short period as one year a pipe line that will carry over 400,000,000 cu ft of gas to Ohio and eastern cities.

Six Contractors Do Work

N. A. Saigh Co., San Antonio, Tex., will build the line from the Carthage gas field in Texas to Lisbon, La.

Latex Construction Co., Houston, is in charge of the work from Lisbon to the Mississippi river at a point below Greenville.

O. C. Whittaker Co., Fort Worth, Tex., will build the line from the Mississippi river crossing to Lula, Miss. (The 63-mile section from Lula to Memphis is already in the ground and in operation.)

Horrigan Construction Co., Houston, is responsible for two spreads covering the 210 miles between Memphis and Slaughters, Ky.

Williams Brothers Corp., Tulsa, Okla., has two spreads in the field to lay the 180 miles of pipe line from Slaughters to the Ohio river at a point near Louisville.

Midwestern Construction Co., of Tulsa, will build the final section from Louisville to the northern terminus of Lebanon, O., where it will connect with the present Big-Inch system.

INDUCTION BRAZING

(*Continued from page* 19)

3,000 psi is generally accepted as a satisfactory strength for a silver-brazed joint. Another advantage of this silver-brazing method is that there is no decarburization of the surface.

Internal and External Coils

Special fixtures are constructed to facilitate the brazing or soldering of either simple or intricate assemblies, having either regular or irregular joints. Coils may be formed for both internal or external applications of heat. Timing devices with settings ranging from a split second up to a few minutes provide accurately controlled heat for each job. The copper tubes (coils) are kept from overheating by cooling water from the city supply lines. The faucet pressure of about 60 psi is ordinarily sufficient, but in coils of very small diameter a pump is used to raise the pressure to 250 psi in order to maintain sufficient circulation for proper cooling.

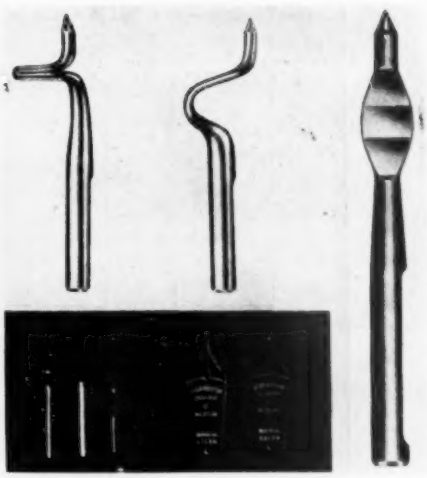
In Fig. 5, we see a front axle shaft for a motor scooter being silver brazed to an axle bracket. Here, an internal type of coil is employed with one of the spark-gap generators. General procedure is to first clean the parts in a hot alkaline cleaner, then add flux and a ring or strip of silver alloy. Heating is carried on for two minutes at 350 kilocycles.

Fig. 6 shows the silver brazing of a small pinion to a gear, a job requiring an external coil. Heating is for 15 seconds at 350 kc.

The delicate job pictured in Fig. 7 is to silver braze exhaust stacks to a cylinder of a miniature aircraft engine. The straight-bored cylinder has been machined from 2-in. bar stock of B-1113 alloy and induction heat-treated to 2,000 F with the 30-kw spark-gap generator. The two exhaust stacks, which extend out horizontally, are brazed to the cylinder in 45 seconds at 350 kc with a spark-gap machine, using an internal coil.

This modern method of hardening, annealing, brazing and soldering is recommended to all manufacturers whose volume does not justify the purchase of more elaborate heat-treating equipment.

1—BENCH WELDERS join abrasion-resistant tips of a "precious" alloy to the shanks of Pfanstiehl long-playing phonograph needles



2—DIFFERENT TYPES of shanks are formed after the tips have been welded

Needles *and* Pens

Only by resistance welding is it possible to make the tiny weld which joins the precious-metal tip to the shank of phonograph needle or the nib of a pen

BY LEE H. JUDGE

RESISTANCE WELDING—the same high-production process used to fabricate automobiles, steel houses, trucks, airplanes and other large metal products—also plays an important role in the manufacture of many tiny precision items. Let's consider two of them.

Phonograph Needles

Pfanstiehl Chemical Co., Waukegan, Ill., produces phonograph needles which are noted for their long-playing ability (some 2,000 records may be played with one needle). The secret is a tiny piece of precious metal welded to a base-metal shank. The so-called "precious metal" is a secret alloy of costly metals blended to achieve long wear and resistance to abrasion. Because of its high cost, it is necessary to use a "base metal"—steel, bronze or stainless steel—to hold the "contact" point. The problem then becomes one of joining two dissimilar metals on a production basis.

Resistance welding proved the best process for several reasons. First of all, the point-of-weld can be accurately centered. This makes it possible to use a smaller piece of tipping material—a very important cost factor as the material is priced at from $175 to $250 per Troy ounce. Equally important is the strong bond between the two very dissimilar metals. A broken tip on a phonograph needle can cause irreparable damage to an expensive record library; consequently, the weld must be strong and permanent.

A row of bench welders (Fig. 1) joins the tiny parts with speed and precision. The operator merely inserts a needle shank (or pen nib) into the holder, and the machine automatically feeds a pellet of precious metal into position. The holder is lowered, a switch is pressed and the weld is completed almost instantly.

The welded tip is ground to size, shaped and polished. Then the shank is shaped by grinding, stamping and swaging (Fig. 2). A strong weld is especially imperative in the grinding operation, for broken welds would cause excessive rejections.

In fountain pens as with phonograph needles, Pfanstiehl has found that resistance welding cuts welding cost, improves production efficiency and makes for more attractive finished articles.

Fountain Pen Tips

Even the gold used in fine fountain pens is much cheaper than the alloys of precious metals used to tip them. The old method of welding precious-metal tips to pens was to use a gas flame and a special gold flux. This was slow and costly. Another disadvantage was that it was necessary to make the weld before final forming of the blank. Use of resistance welding enables the blank to be taper-rolled and formed to nib shape before welding, with considerable saving of time and material.

When stainless steel was substituted for gold as the "base metal" of the pen nib, it was possible for fountain pen makers to broaden their market by offering a fine writing instrument at considerably lower price. The stainless steel, incidentally, is an alloy specially selected to resist the corrosion of inks. Its adoption made resistance welding mandatory as this process is the only satisfactory method of joining the "precious" alloy of such metals as osmium and iridium to stainless steel.

1—BALCONY-CORRIDORS with rails welded at a rakish 15-degree angle give new $2,000,000 luxury hotel the look of an ocean liner

2—TIMBER BELOW first-floor rail will be covered with aluminum "waffle"

Hollywood's All-Welded C

A new 224-room, three-story hotel in the movie capital has structural members of lightweight alloy steel—16-gauge channels for studding and 14-gauge for joists. Half a million welds were needed

BY MARK FINLEY

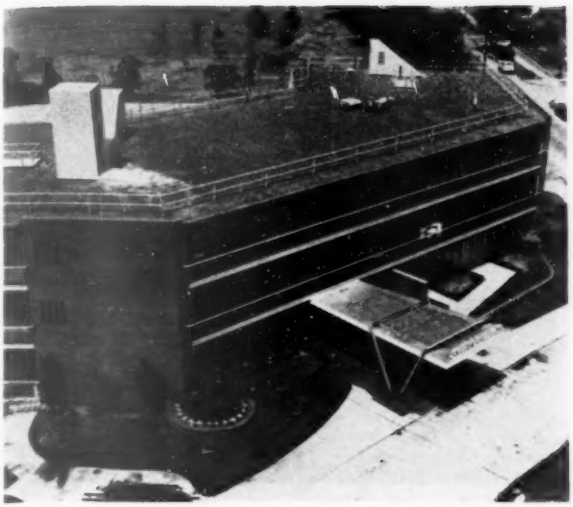
ONE OF THE MOST colorful buildings in the nation is the $2,000,000 Country Club hotel recently opened in Hollywood. This all-welded steel building is modeled after the famous Copacabana Palace in Rio de Janeiro and is featured by a color system in which each floor is of a different color. Thus the ground floor is aqua, the second floor is salmon, and the top floor is mustard yellow. Even the venetian blinds carry out the color scheme.

5—ON UPPER BALCONY, we see outward-leaning guard rails, welded from steel members, and tubular supports upholding the overhanging roof

500,000 WELDS

This 224-room, three-story hotel in the movie capital is said to be the largest all-welded structure of its type in the world. It has more than half a million welds, according to Lewis Blagg, who, with his partner George Kroman, wrapped up the job in nine months after other welding firms had estimated that it would require at least a year and a half. There is a 1½-in. weld at 2-ft centers on every member. Blagg & Kroman worked 11 arc weldors continuously eight hours a day, five days a week for the nine-month period. Thirty-nine steel erectors set the pace for the welding gang.

An experimental project of a large steel company (Great Lakes Steel Co.), the building has structural members made of a lightweight alloy steel, which is said to account for the



3—PORCH AT auto entrance is an eye-catcher because of unique V-shaped supports connected by saddle strips

4—U-SHAPED CHANNELS are stuck into ground cement at proper angle to make the eye-catching pattern

Country Club Hotel

use of only 141 tons of steel in the total 79,845 sq ft of floor space.

Studding is formed of 16-gauge U-channels and joists of 14 gauge. A few members of 12-gauge steel are used where heavier stresses are encountered. To gain extra strength, two of the U-channels were welded back-to-back at points where such reinforcement is needed. The only conventional structural steel used in the building is in the lobby, and even there it was used sparingly. Largest piece is a 24-in. I-beam, 65 ft long, across the top of the lobby.

To cut the steel members on the job, a 17-in. friction saw was used. Measurements had to be exact, as there were no opportunities to insert wedges or otherwise improvise close fits. Tolerances were held to 1/16 in.—an imposing feat in so large a project. Mostly 3/32-in. electrodes were used for welding with some 1/8-in. electrodes on heavier members.

No Inner Corridors

A unique feature of this structure is that it has no conventional corridors. Instead, exterior corridor-balconies run around the building on all three floors. To absorb earthquake stresses, 12-gauge steel strap 2½ in. wide was used as lateral bracing on all floors. Another purpose of this strapping was to avoid drilling or flame-cutting holes in bearing members; it also creates tolerances for the plaster.

From the outside, the building has something of the appearance of a luxury ocean liner (Fig. 1). In particular, the hand rails, leaning outward at an angle of 15 deg, present a rakish appearance. The 15-deg angle was calculated to shield the dress hemline of women guests from upward-peeping gawkers.

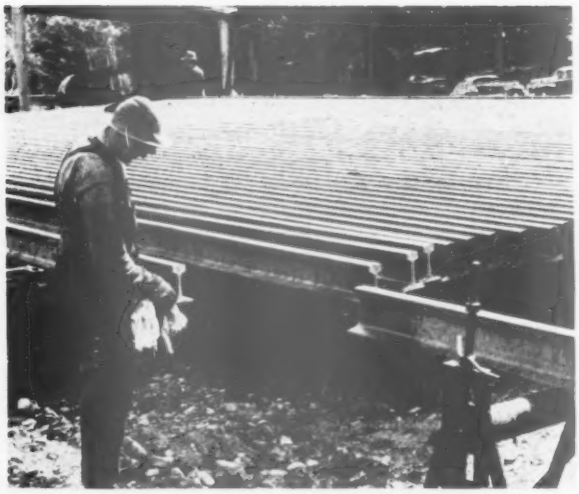
A view of the railed balconies from a corner can be seen in Fig. 2. The bare timber below the rail on the first floor is about ready to be covered with a safety-tread aluminum "waffle" as has been done on the two upper decks. This material is a specially treated aluminum that will not tarnish, even in the "smog" of once-sunny California.

In Fig. 3, we see a bird's-eye view of the front of the new two-million-dollar luxury hotel. The porte-cochere or carriage porch catches the eye with its unique design of V-shaped supports connected by saddle strips. The close-up, Fig. 4, shows how the two channels are brought together to form the V on each side of the roofed porch. The points of

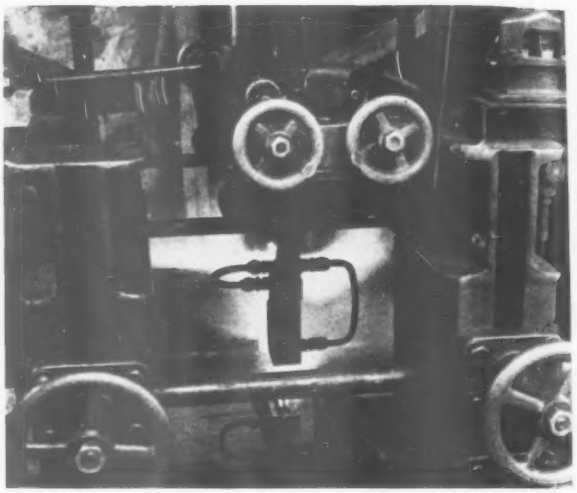
(Continued on page 28)

6—WELDED CHANNELS impart a streamlined look to fire escape

7—PIPE STANCHIONS are concealed beneath aluminum "waffle"



1—RAIL SAW, housed in enclosure in background, squares up and smooths the ends of the 39-foot rails



2—WELDING UNIT. This close-up shows only a few of the 125 tips which heat the joint to around 2,300 F

5—GRINDING of the still-rough weld is done in two stages. Here a flex-arm grinder does the coarse work

6—POLISHING by means of a portable unit is done at eighth station on the welded rail production line

Pressure-Welded Rails i

Four miles of the longest railroad bore in the western hemisphere were relaid with 115-lb continuous rail. Pressure welding joined the 39-ft rails into lengths of 1,326 ft for loading on flatcars

BY RAY BLOOMBERG

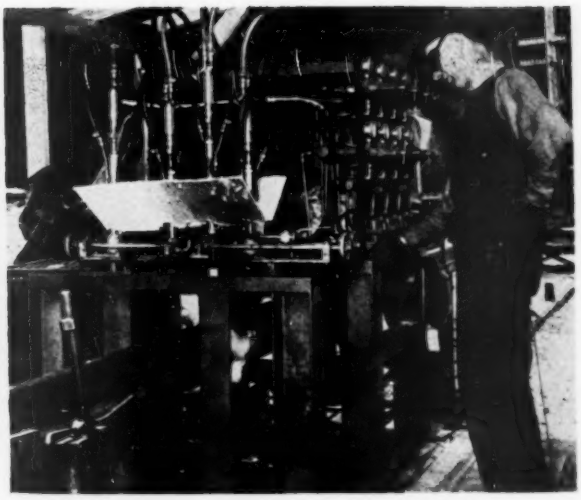
THE BIGGEST continuous-rail project ever undertaken in the Pacific Northwest begins at Scenic, Wash., west portal of the Great Northern Railway's 7.79-mile Cascade tunnel, 98 miles east of Seattle and 2,224 ft above sea level. Four miles of this long railroad bore were relaid with 115-lb continuous rail to replace the 110-lb jointed rail previously in use. Cost was around $189,000, and the project was completed in about two months by means of a pressure-welding set-up which turned out a 1,326 foot length of welded rail every day.

Rails on Assembly Line

The latest type of oxyacetylene pressure-welding machine was leased by the Great Northern from the Oxweld Railroad Service Co. for use on the Cascade tunnel job. All equipment on the "assembly line" was manned by Great Northern personnel, specially trained in its operation by Beach Miller, Oxweld instructor.

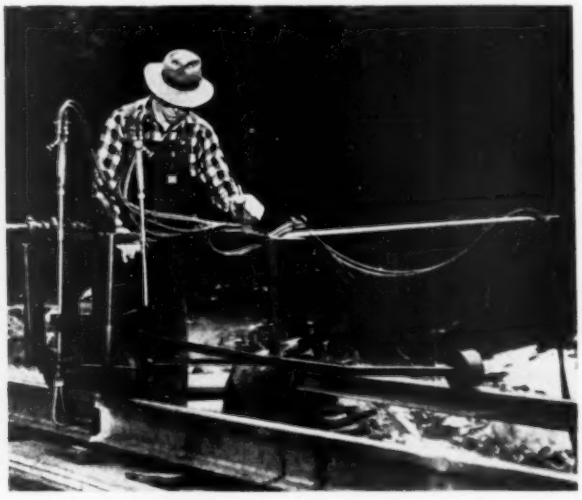
First station on the pressure-weld-

3—FLAME-TRIMMING removes excess metal. Guide on the right is used to check the cuts at top and sides



4—AT NORMALIZER, stresses produced by pressure welding are relieved by heating weld to 1,500-1,550 F

7—INSPECTION is made by magnetic-particle method to reveal weld flaws or evidence of faulty grinding



8—FLAME-CLEANING removes mill scale, after which a corrosion-resistant primer is applied by wire brush

ls in Cascade Tunnel

ing line was a rail saw (Fig. 1) to which the 39-ft lengths of rail were passed on skids. Here the rail ends were squared up and smoothed. The rail was then returned by skids to the rollers, which carried it up to the pressure-welding machine.

At Station No. 2, where actual welding was done, the rail ends were first washed off with ethylene dichloride and polished. The two ends were then turned up and clamped together under a pressure of 2,500-2,700 psi. Oxyacetylene flames jetting from 125 welding tips (Fig. 2) at a temperature of 6,000 F heated the joint to a temperature of around 2,300 F. The weld was made in about five minutes of this intense heat and pressure.

Excess metal was trimmed from the weld with an oxyacetylene hand torch (Fig. 3) at Station No. 3. Meanwhile, two more rail ends were fused together in the pressure welder.

At Station No. 4, the normalizer (Fig. 4), the weld was reheated to a temperature of 1,500-1,550 F to relieve the stresses produced by the pressure-welding operation.

Grinding and Polishing

The still-rough weld was now moved along rollers to the first two of a series of three grinding and polishing stations. At Station No. 5, the flex-arm grinder (Fig. 5) does a coarse job. At Station No. 6 the seam is ground flush.

Station No. 7 was a power winch which utilized a rail clamp and steel

9—WEST PORTAL; flatcars enter tunnel with 1,326-ft rail lengths

10—EAST PORTAL of Cascade Tunnel showing how rail is unloaded from flatcars. The heavy rail sags as the cars are pulled out from beneath it

cable to move the welded rail along the assembly line to the eighth station where the welded joint was polished (Fig. 6). After polishing, the joint was dusted with a fine powder (Fig. 7) for magnetic-particle inspection. The pattern of the magnetized powder under the electromagnetic testing unit served to reveal any flaw in the weld or evidence of seams not ground out.

Ninth and final station was for the oxyacetylene flame-cleaning of the new rail (Fig. 8) to loosen and remove mill scale. Immediately after flame-cleaning, a corrosion-resistant rail primer was applied by a wire brush.

Loading on Flatcars

The welded rail was now carried by a roller line to the top of a string of 25 roller-equipped flatcars. The lead car had two sets of rollers; each of the other 24 cars had one set each. The flatcars were on a 2.2% grade to facilitate handling of the rails. This particular method of transporting welded rail was worked out by Great Northern engineering officials after study of a similar operation on the Elgin, Joliet & Eastern Railway. The rollers were fabricated in Great Northern shops at Hillyard, Wash., and bolted on 7 by 9 in. timbers. They were then mounted on flatcars.

Although each roller set was equipped with sufficient individual rollers to handle 12 rails abreast, only three welded lengths could be moved at a time on the Cascade tunnel job because of the limitation of train movements in the single track tunnel. When these three 1,326-ft lengths of welded rail were loaded on the flatcars, they were secured against lateral movement by a clamping device tightened by bolts. The 75-ton load was then moved into the tunnel, entering at the west portal (Fig. 9) to be unloaded from the flatcars at the east portal (Fig. 10).

The unloading of one of these quarter-mile lengths of continuous rail was quite a trick. A clamp was attached to the rail end and was secured to the road bed by means of a steel cable and rail shackle. The string of flatcars was then slowly pulled out from beneath the rail. After the relaying gang had completed the laying of the new rail, the joints between pressure-welded sections were welded manually.

Top supervising officer for the Great Northern was L. J. Gilmore, general roadmaster. On-the-job supervisors were Henri Ferryman, division roadmaster, and Adolph Holm, district roadmaster. Oxweld general supervisor on-the-job was F. J. Duffie, and the foreman of the Great Northern welding gang was Harold Rich.

Because of the advantages of longer service life and reduced maintenance cost, Great Northern expects to lay the remaining mileage of the long tunnel through the Cascade mountains with pressure-welded rail in 1950.

COUNTRY CLUB HOTEL

(*Continued from page 25*)

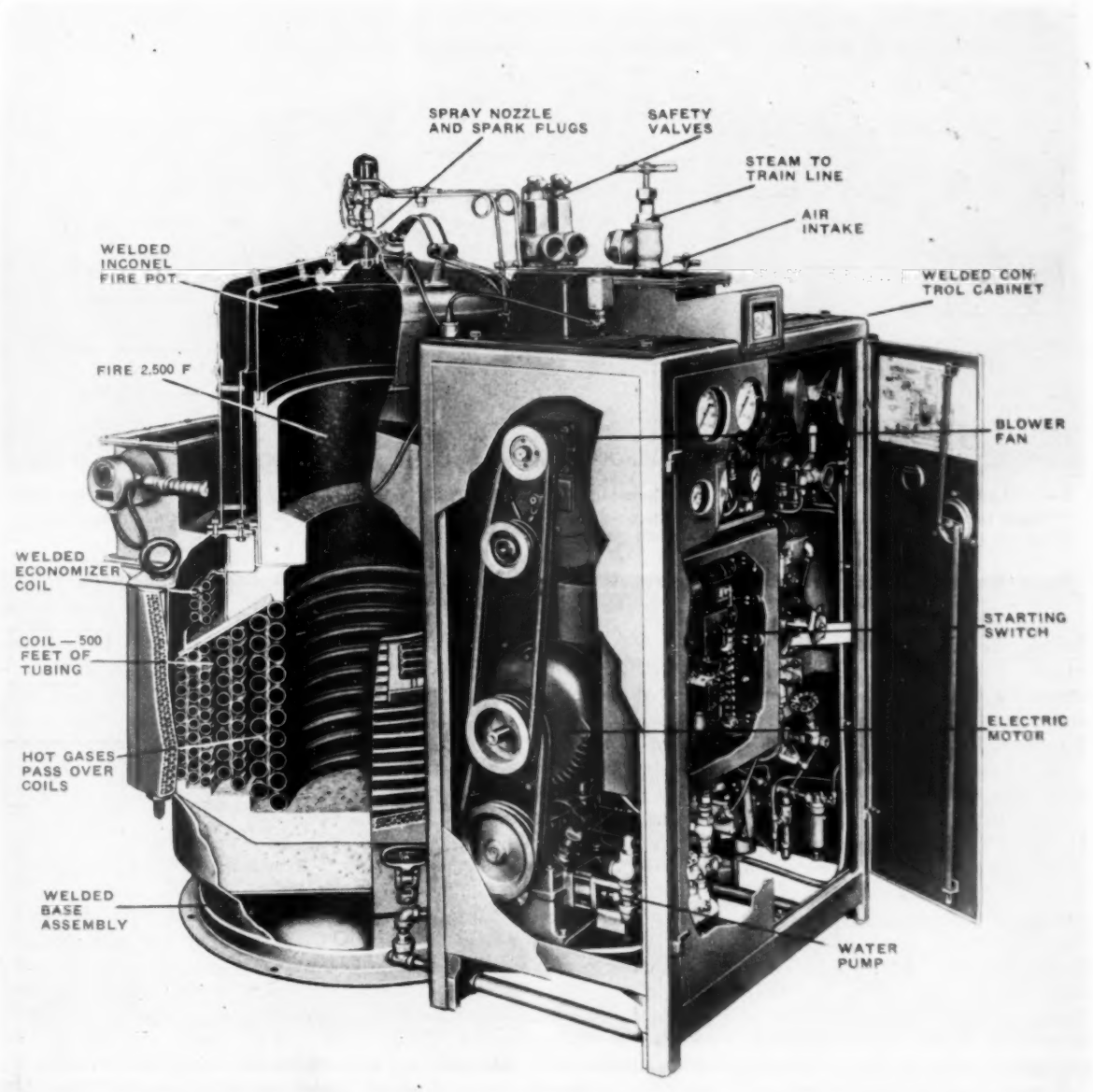
the V's, stuck into the ground cement, are hidden by the brickwork and its enclosed foliage.

In Fig. 5, we walk along the topmost balcony just below the overhanging roof. Ample space is provided for guests who would like to sun-bathe. The corridor-balcony has a runner of rubber matting. Vermiculite, a Montana volcanic substance almost 20% lighter than ordinary aggregate, is used instead of gravel in the floor concrete.

Camouflaged Pillars

A close-up of the fire escape, Fig. 6, shows us the compactness and streamlined appearance of the welded channels. And in Fig. 7, we see how pipe stanchions in the hotel's Sunset Terrace are concealed by the aluminum "waffle" material. Looking at the unique pillar in this picture are two of the owner-builders: Maurice M. Miller (left) and Zimmel Miller, of Dayton, O. Maurice Miller also directed the engineering construction. Architect on the building was Kemper Nomland, Sr.

One of the biggest problems encountered in the building of this new Hollywood glamour palace was the foundation. Cylindrical caissons of 36-in. diameter were sunk to depths varying from 18 to 35 ft to uphold the structure. Water was encountered at 32 ft.



1—CUTAWAY diagram of interior, showing the component parts of a Vapor-Clarkson—

Welded Steam Generator

BY WILLIAM C. HENZLIK

Even though there's no longer a steam locomotive in front of them, the passengers of Diesel-powered streamliners are kept warm with steam delivered from a generator no bigger than a clothes closet

DIESEL locomotives need steam! High-pressure steam is necessary in the winter to keep passengers warm; in summer many trains are cooled by a steam-jet air-conditioning system. Supplying this steam, thousands of pounds per hour, to practically every Diesel-driven streamlined train in the country is a welded steam generator about the size of a clothes closet (Fig. 1).

There were no such steam generators in the early 30's when Diesel locomotives were first coming into prominence. Manufacturers of steam

2—WELDOR AT LEFT fabricates air intake housings. Weldor on the right tack welds a water treatment tank. Note uncluttered booths

3—INCONEL electrodes weld fire pot. Fuel oil is burned inside Inconel pot

Neat booths, well ventilated, speed manufacture of steam generator components

boilers thought it was foolish to dream of producing even 500 lb of steam per hour by a separate generator in a Diesel. Everyone knew it couldn't be done.

In 1933, however, an arrangement was worked out between the Vapor Heating Corp., of Chicago, and Alick Clarkson, a man who had some ideas on how to generate steam quickly. After many months of experiment, the collaborators developed a generator able to produce 800 lb of steam per hour. The first two were installed in one of the early Union Pacific streamliners. Today more than 2,400 much improved generators serve our nation's trains.

Present Vapor-Clarkson steam generators produce more than 4,000 lb of steam per hour. They build up full working pressure of 200 psi in two minutes from a cold start. During World War II, these generators heated small plants, served as main sources of steam in dry-cleaning establishments, heated Diesel-powered warships and supplied the steam source for shipboard cargo handling winches.

Coil-Type Generator

The Vapor-Clarkson steam generator is similar, in theory, to other coil-type generators. Basic components are illustrated in the cutaway view (Fig. 1). The steam is generated in a series of coils made of about 500 ft of seamless steel tubing. The coils are staggered in a patented design and are so constructed as to be self-compensating for expansion. They split into narrow films the combustion gases, generated in a refractory-lined fire pot at a temperature of around 2,500 F. The heated gases flow in opposite direction to the course of the water.

The heat release, as computed by company engineers, is 1,000,000 Btu per cu ft of combustion space. This is sufficient to turn into steam 90 to 95% of the water flowing through the coils. The remaining 5 to 10% of water serves to carry a "sludge" of impurities and chemicals to a separator, from which the cleansed water is returned to the feed-water tank.

The water supply, separate from the generator, is so controlled that should any control devices become inoperative the generator cannot explode—actual tests have shown that not enough heated water is present.

The fire pot, made of welded Inconel, has a film of cooling air moving over its surface. Fuel burned is regular Diesel fuel oil from the main fuel tanks. This is atomized under pressure and forced out through a spray nozzle.

Vapor-Servo controls coupled with automatic devices and switches monitor the steam temperature, stack temperature, coil pressure and water temperature in the feed-water tank to keep a predetermined amount of steam circulating through the train during even the most severe climatic changes. The only controls usually operated by the fireman are a single starting switch and another for blowing away sludge from the steam separator.

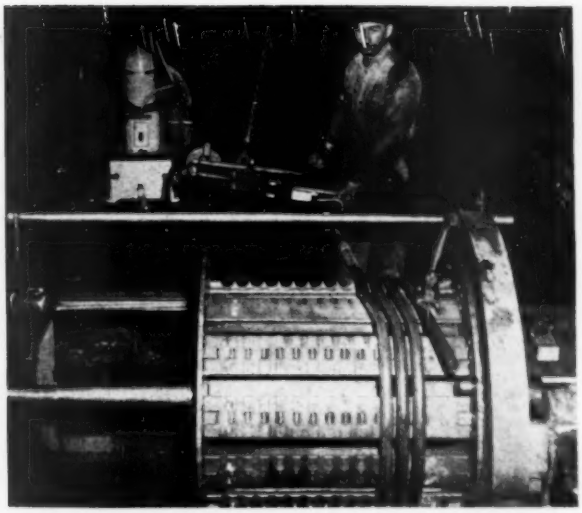
Model Welding Department

Welded construction was necessary on the very first generator, and it has been essential to manufacture ever since. Every attention has been made in Vapor's welding department to secure clean, efficient working conditions. Each booth (Fig. 2) measures approximately 9 to 11 ft and is enclosed by sheet-steel partitions painted battleship gray. Overhead is a high-capacity ventilator system which sucks up welding smoke and fumes so fast they disappear before the weldor can raise his helmet to inspect his work. Each booth is swept clean and is singularly uncluttered. In Vapor's annual spring clean-up week, the welding department has taken first place in the plant for two years for maintaining a neat and safe working area.

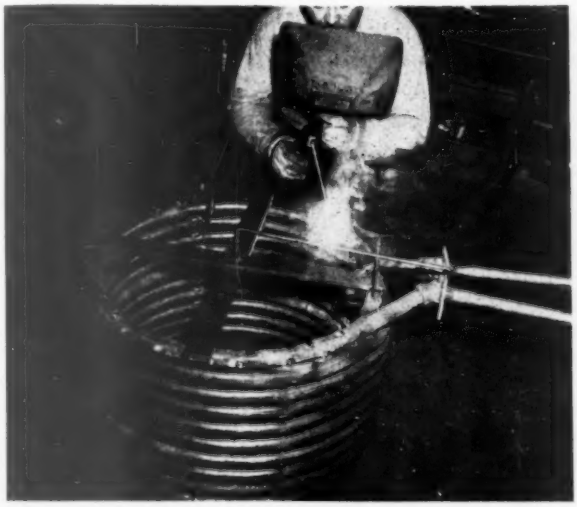
A bank of 20 d-c welders is placed on a raised wooden rack in the rear of the welding booths. Operated by remote controls in each booth, the welders range in capacity from 150 to 300 amp.

When the ventilating system was

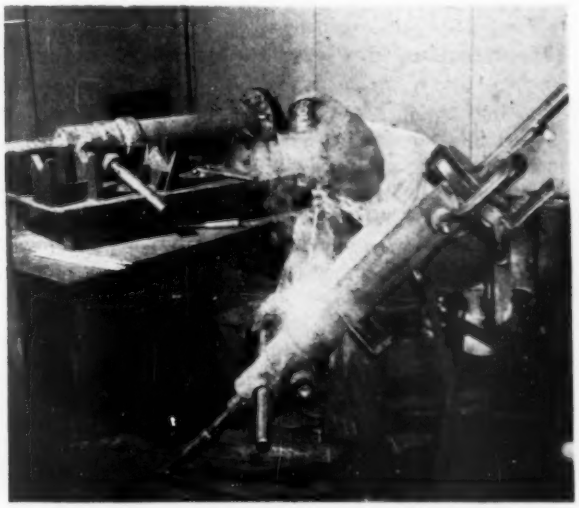
4—OXYACETYLENE welding joins 1¼-in. seamless tubing. It must withstand a 1,200-psi hydrostatic test



5—COILING welded piping with special winding machine. The ductile welds display no tendency to crack



6—CONNECTORS between sets of coils are welded to finished dimensions. Holding fixture is one of many



7—STEAM SEPARATOR is fabricated from rolled, forged and cast steel, steel tubing and steel forgings

first put into operation, it did not work right in every area. The trouble was traced to several welders on the floor that were used in conjunction with the overhead machines. The fans on these welders created disturbing air currents that effectively counteracted the overhead ventilators. After the offending machines were elevated to the rack, the trouble disappeared.

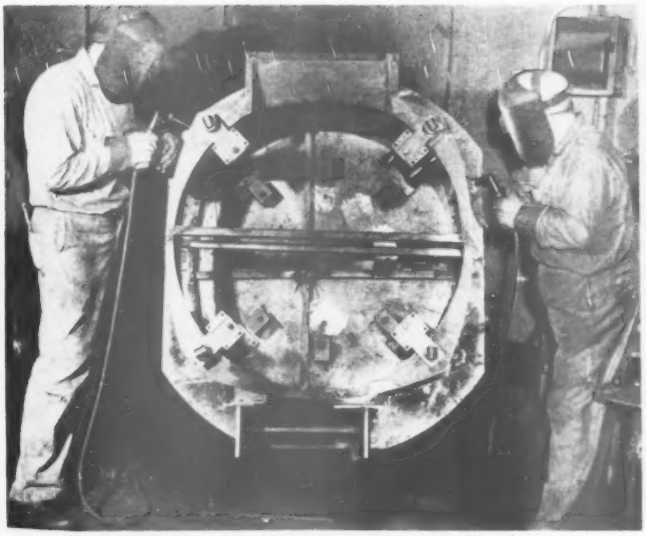
Inconel Fire Pot

A major component of the steam generator is the fire pot in which the Diesel oil atomized under pressure is burned. The flame temperature of 2,500 F brings the temperature of the metal part of the fire pot to 1,000-1,200 F, high enough to seriously deteriorate almost any steel. In their search for a heat-resistant metal that could also be readily welded, the plant engineers decided on Inconel, which has a melting point of 2,540 F.

The skirt is made from a 16-gauge sheet which has been sheared and then rolled. The top cone blank is nibbled, pierced for attachments and then formed with a press. Welding is done in a single pass with ⅛-in. Inconel electrodes (Fig. 3). Welding diameter and height of the fire pot must be held to close tolerances; therefore, they are held to finished dimensions in the pedestal positioner shown at bottom of the picture.

Positioning devices of every type are used in almost every phase of manufacture at Vapor. Many of the fixtures are fine examples of proper design. They can be loaded quickly and easily; they are sturdy and durable; they hold the workpiece in place for easy welding, and they are quickly unloaded.

A major reason for jigging all parts is to insure the greatest possible interchangeability of assemblies from generator to generator. It must be remembered that these generators are not built on a produc-



8—TWO WELDORS work on supporting structure. Structure is held to close tolerances by a fixture on powered positioner

9—COIL RETAINER ring supports coils on steps. Refractory cement will fill the lower retainer

Positioning devices assist fabrication of generator's supporting structures

tion line but to specific order from a particular locomotive builder, railroad or industrial firm. Quite often mechanics in the railroad shops have to interchange casings, coils, etc., from different models of generators, and it is desirable that this should be possible.

Powered and stationary positioners, in combination with bolted and screw-fastened jigs and fixtures, are in use in every welding booth. Foreman Joe Gron of the welding department is at present working on a plan whereby small fixtures and jigs can be kept in labeled racks where they will always be available for either single or multiple orders of a component.

Coil Manufacture

The heated gases from the fire pot are directed around a series of seamless steam generating coils in which feed water is circulating under a pressure of 450 psi. From 5 to 7 gal of water per minute traverse the coils, total length of which is 500 ft.

The seamless tubing comes to Vapor in mill lengths varying from 20 to 24 ft. For various sizes of generators, pipe diameters in the coils run from ½ in. (inside pipe size) to 1½ in. ips. For the models described in this article, the pipe used is 1¼ in. Before being formed into coils, the mill lengths of tubing are gas welded into lengths of 175 to 300 ft.

Ends of each section are cleaned with carbon tetrachloride before welding. The sections come through the wall at the rear of the building and are supported on standards after they have been welded into longer lengths. Each pipe end is gripped by chains in a rotating welding fixture (Fig. 4), and the pipe is rotated for position welding by a foot-operated clutch mechanism. Close control of rotation is obtainable with this arrangement.

Welding rod used for butt welding the pipe is AWS-ASTM Type GA 65 and GB 60. Two passes are made on each joint. The welding temperature is just below the fusing temperature of the steel, which has a composition of 0.10 to 0.20% carbon with 0.045% maximum of sulphur and phosphorus.

Many of the pipe-welding procedures performed at Vapor were pioneered by Jack Miller. Weldors on this job are certified and rechecked every six months by the Hartford Steam Boiler and Pressure Vessel Inspection Co.

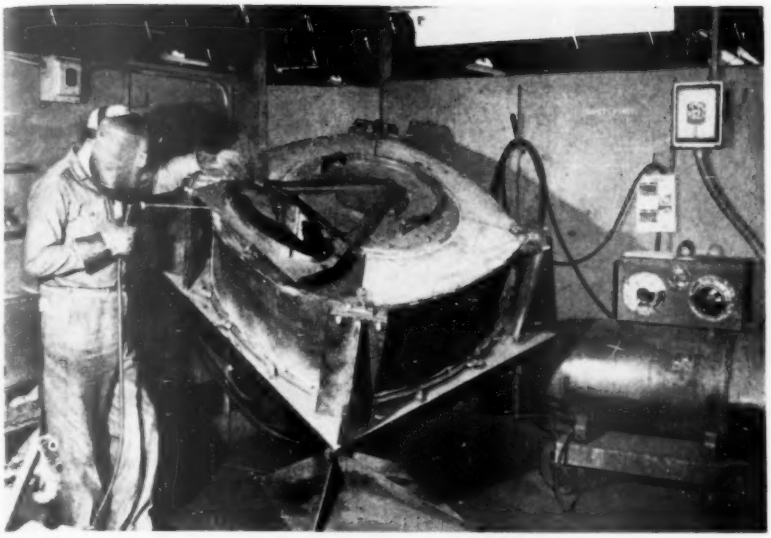
The 175 to 300 ft lengths of tubing are wound into coils on special winding machines (Fig. 5). Each generator has at least three coils, and a different spool is used for each size of coil. The welded joints are ductile and show no tendency to split or otherwise fail in the winding operation.

After a coil has been wound, it is stress relieved for four hours at 1,300 F. The coil is then tested to a 1,200-psi hydrostatic pressure, coated with a rust and corrosion preventive and sent to the storeroom for eventual assembly into a generator system.

Later, when the coils are assembled into a concentric group of three, the separate coils are joined by arc-welded jumper pipes (Fig. 6). Each round of coil is separated by a stainless-steel spacer to insure the proper contour despite water pressure, movement of the train and expansion-contraction phenomena. Every other spacer is welded on one side only so that the piping can expand freely between the wholly welded spacers.

Economizer Coil

A fourth or "economizer" coil is used in the newest Vapor-Clarkson steam generators to utilize the heat of the exit gases as they enter the exhaust stack. This coil is 75 to 150 ft long, and it is used to raise the temperature of the water as it first enters the coil system. Experience has shown that the greatest oxidation and corrosion will occur during the first 50 to 60 ft of the coil; it is evident that the economizer coil can take this abuse and be replaced



10—OUTSIDE FRAME of generator is welded at fire pot section with an elaborate fixture. The elliptical hole is the base of the exhaust stack

easier than one of the larger coils can be replaced.

Each set of coils is assigned a serial number, which remains with it all through storage in the warehouse, assembly into the generator, service on the railroad and return for reconditioning. By recording the numbers of each set of coils, Vapor is able to keep track of the materials used, the fabrication methods employed and other information that might be needed in maintenance. Serial numbers are also necessary for the Hartford inspection test.

Steam Separator

We have already seen how the 10% of the water that is not evaporated into steam carries the sludge formed by water-purifying chemicals and solids to a separator, from which the cleansed water is returned. The main job of the separator, however, is to remove most of the moisture from the steam (a figure of 99% is often achieved). Sludge taken out of the water settles to the bottom of the separator for periodic removal by the fireman. As water from the separator goes back to the feed-water tank, it passes through a small heat-exchanger unit consisting of approximately 57 ft of ⅜-in. coiled copper tubing. Heat from the separator water preheats the feed water on its way to the main coils.

The separator (Fig. 7) is fabricated from cast steel, steel tubing and steel forgings. Welding is performed with E-6010 electrodes. Silver solder is used for making all connections on the exchanger. A silver-brazing alloy is used on the copper spacers between coil rounds.

Each separator is tested to a hydrostatic pressure of 900 psi. Weldors fabricating these separators must be certified by the boiler inspectors and rechecked every six months.

A sturdy system of steel supports is needed in the Vapor-Clarkson steam generator to mount the coil system, fuel-burning nozzle assembly, fire pot and air ring, blower, blower housings and refractory materials of various types. Adding to this burden is the electrical control cabinet, servo-mechanism, operating controls and instruments.

Much of this weight is supported by structural components fabricated of mild-steel sheet and plate of sizes ranging from 16 gauge to ¼ in.

Fig. 8 shows fabrication of the center section, which covers the coils and supports the refractory material around them and the blower section above them. This supporting structure is of 11-gauge mild steel, blanked to shape, rolled and welded. E-6012 electrodes are used with settings of 100 to 300 amp to weld the various parts of the frame. This particular section is held to 1/64-in. tolerance by the bolt- and -nut jigs on the powered positioner.

Steps for holding the steam generating coils can be seen in the coil retainer that is being welded in Fig. 9. Refractory cement is placed up to the lower corner of each step, after which the coils are seated. Again, the material is 11-gauge mild steel.

An elaborate holding fixture for welding the structure at the fire pot section is shown in Fig. 10. The elliptical hole at the left is the base of the exhaust stack. Tolerances at this section may be as small as 1/64 in.

Shut-off Control

Across the lower section of the coils is a steam-temperature limit control. Should the temperature of the steam in the coils get up to superheat range (about 450 F in train heating systems), this control shuts off the fuel supply to the burning nozzle. The shut-off is accomplished by a rod of high-nickel content housed in a stainless-steel cylinder. The rod has a small coefficient of expansion, and the cylinder has a high coefficient of expansion. Since the high-nickel rod is welded to one end of the stainless cylinder, the approaching superheat temperature results in a retracting or pulling action of the rod relative to the cylinder. The nickel rod is welded to the stainless tube with a 25-20 nickel-chromium electrode.

Though welding is the major fabrication tool of all operating parts going into the generator, it is not so generally used in final assembly. Bolt and screw fastenings are more practicable because of the need for maintenance, inspection and repair. From two to four days are required to assemble a complete steam generator. Each unit is built by a group of three or four men that work on it through all stages of assembly. Each man is held responsible for certain assembly functions and fulfills a particular part in his team.

Generators are tested from two to four days under full steam pressure and in every sort of operation. Instruments are checked for proper calibration, and all safety devices are operated. When the generator leaves the plant, it is ready to begin its task at the turn of the starting switch.

Newest uses found for these welded generators are as stand-by heating sources for outside-parked bus fleets, oil-field drilling operations, pile-driving operations, food and chemical processing, plastics forming.

Courtesy Chicago Bridge and Iron Co.

STAINLESS wear plates are welded inside an 8-ft refinery tower. Fumes are harmless with good ventilation

Courtesy The Linde Air Products Co.

GALVANIZED TANK is gas welded in a hood to remove the zinc-oxide fumes that might cause metal fume fever

Welding and C

Stainless steel, aluminum are no more hazardous to weld than mild steel. Metal fume fever from zinc oxide particles isn't pleasant but lasts for only 24 hours. But beware of both lead and cadmium

BY CLYDE B. CLASON

Part one of this survey of current medical literature, published in the October issue of THE WELDING ENGINEER, *was confined almost exclusively to the fumes generated during the welding and cutting of mild steel. It was shown that welding fumes do not cause pneumonia and tuberculosis. Other topics included were weldor's lung (siderosis), the hazard of the nitrogen oxides and the important question of ventilation.*

ARE the fumes generated from the welding of stainless steel more dangerous to the health of a weldor than those from mild steel? The evidence for it is slight. Any hazard of stainless-steel fumes would have to come either from the chromium which all stainless steels contain or from the ingredients of the electrode coating. Let's examine the case against chromium first.

First witness called is Dr. W. D. Schmidt, author of an extensive paper on the industrial hazards of metals used in the aviation industry. Dr. Schmidt does not find chromium to be of any "toxicologic importance" in the solid state but suspects that there may be a possibility for "systemic chromium poisoning" when the metal is in the gaseous state and is inhaled via the respiratory tract. Chest pain, eye irritations and chronic cough might also be caused by chromium fumes, speculates Dr. Schmidt. He admits, however, that the "symptomatology caused by the irritation of the mucous membranes from chromium fumes" is common to other fumes such as nitrous fumes, fluoride fumes, ozone, etc. It is, therefore, difficult to determine whether or not chromium is really at fault.

Zinc chromate caused respiratory difficulties during the war when plates primed or painted with this compound had to be flame-cut or flame-shrunk. Cases of chrome sores were also reported arising in one shipyard from the spraying of zinc chromate. Zinc chromate, however, is not the same as metallic chromium or chromic oxide. The chemical and physical behavior of a metal cannot be predicted from the behavior of one of its salts; look how different ordinary table salt is from either sodium or chlorine!

Fleischer, Nelson and Drinker found that the coatings of stainless-steel electrodes were high in calcium fluoride. "It is believed," say these authorities, "that where the weldor works in dense concentrations of this type of welding fumes with inadequate ventilation, there may develop upper respiratory tract and conjunctival irritation." Again, experimental data are lacking.

In part one of this article, it was noted that investigators Drinker and Nelson had burned many stainless-steel electrodes in a gas cabinet and failed to find the hydrofluoric acid which could theoretically be evolved from the electrode coating.

All in all, it does not appear that fumes arising from the welding of stainless steel are any more hazardous than welding fumes from mild steel provided—and this is important—that adequate ventilation is maintained. Drinker and Nelson recommended the same local exhaust ventilation as for mild steel—at least 200 cu ft per weldor per minute with the exhaust hood placed within 8 inches of the work. They also recommended the same threshold concentration of 30 mg of ferric oxide per cubic meter used as an index of air cleanliness with mild-steel fumes.

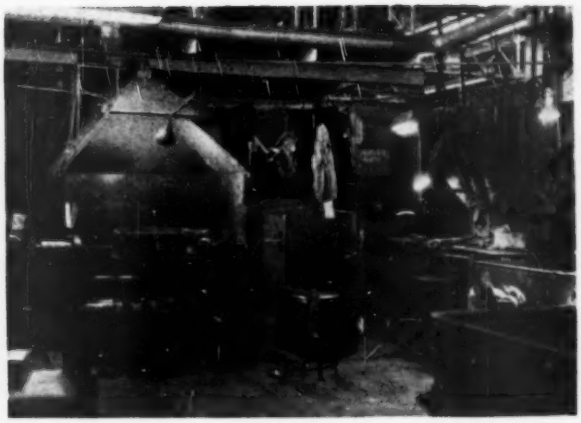
For general ventilation, the recommendation is at least 400 cu ft per minute per weldor.

ALUMINUM AND MAGNESIUM

The alumium alloys, apparently,

Courtesy The Linde Air Products Co.

CADMIUM-PLATED strip (right) forms small droplets. Zinc on galvanized sheet (left) appears to flake off



Courtesy The Lincoln Electric Co.

LEAD-COATED material (terne plate) is welded in an exhaust booth with blower on top to carry off fumes

Cutting Fumes-II

are wholly non-toxic. "There is no such disease as 'dural poisoning,'" states Schmidt, "and still this diagnosis is being made by non-industry physicians every day." Dural is aluminum alloy 52-S, containing 2.5% magnesium, 0.25% chromium and 97.5% alumium. The so-called "dural poisoning" is a dermatitis or skin disease, falsely attributed to contact with dural alloy.

Every weldor knows that the coating of alumium oxide forming on metallic aluminum must be dissolved with a flux before the material can be arc or gas-welded. A powerful chemical flux is needed, and compounds of fluorine are used for this purpose. Some fluorides are poisonous and highly soluble in the blood stream, but other compounds of fluorine are not poisonous and are almost insoluble. It must not be assumed that an aluminum flux is inherently dangerous today, though fluoride fluxes probably did constitute a hazard in the early days of aluminum welding.

By using the inert-arc welding process with argon shielding gas, it is now possible to weld aluminum without a flux, eliminating the last vestige of danger from aluminum welding.

Schmidt opines that the welding of magnesium might possibly constitute a health hazard in the aviation industry. Magnesium fume fever, analogous to metal fume fever from zinc, is said to be caused by exposure to molten magnesium and in operations where magnesium oxide is formed. Apparently, few cases have been reported.

Metal Fume Fever

In contrast to magnesium fume fever, a voluminous literature has been written concerning the 24-hour illness bearing such varied names as metal fume fever, zinc fume fever, brass founder's ague, spelter's shakes, zinc chills, foundry fever, brass chills, metal ague, galvanize poisoning and so on. This illness has been known to medical science since 1831 if not longer. Judging from the symptoms he describes, the sixteenth-century goldsmith and craftsman, Benvenuto Cellini, experienced an attack of it while he was working on his famous brass statue of Perseus.

Common symptoms of this well-known occupational ailment are severe chills, fever up to 103 F, flushing, sweating, irritation of the respiratory tract, dryness of the throat, a dry cough, nausea, vomiting, headache and general malaise. Cramps in the abdomen sometimes occur, as do breathing difficulties. Sometimes the symptoms of metal fume fever are so similar to those of grippe or influenza that it is difficult to distinguish the former illness unless laboratory tests are made of the patient's blood. Metal fume fever is associated with a pronounced leucocytosis or increase in the number of white blood corpuscles.

What to do to relieve a sufferer from metal fume fever is a moot medical question. It used to be believed that it was helpful to drink large quantities of milk, especially warm milk. Now Drinker and Nelson assert that this homely remedy is not of the slightest avail. Nor is any other therapy so far reported—"We have tried hot baths and steam baths, milk, antipyretics and various beverages both alcoholic and non-alcoholic."

Dr. Gocher found that those patients who complained of stomach disorders became nauseated and vomited if given sodium bicarbonate. If bismuth was given, the stomach settled quickly and the patient felt better. Dr. Quinn recommends ten to fifteen grains of aspirin, given at three-hour intervals, for relief of the chest pain and the generalized aches and pains.

The fever and other unpleasant effects are usually over within 24 hours, though it may be a little longer before the blood count is back to normal. Once the patient feels well enough to return to work that ends the matter. The illness has no after effects, and repeated attacks of it apparently do no permanent harm to the weldor. Attacks of metal fume fever are unlikely to be experienced on two successive days since a certain resistance to the ailment persists for the duration of the leucocytosis or increase in white corpuscles.

Respirators and Air Masks

Courtesy General Scientific Co.

Courtesy Mine Safety Appliances Co.

MASK AT LEFT has refillable cotton pads to stop large particles. In the other type, twin chemical filters collect particles before air can be breathed

Courtesy Mine Safety Appliances Co.

Courtesy E. D. Bullard Co.

WEIRD CREATURES above are only an arc weldor (left) and a gas weldor who are properly protected against toxic vapors with air-line respirators

The cause of metal fume fever is generally given as the inhalation of zinc oxide particles. Most of the cases in shipyards occurred during the welding of galvanized steel. However, it can occur just as easily during the welding of brass or other zinc-bearing alloys if the weldor is not properly protected. Dr. Quinn holds that metal fume fever may be due to the combined effects of nitrous gases and metallic particles, among which he includes iron oxide and copper oxide particles as well as zinc oxide. Other authorities do not support this view. The 200-page Public Health Bulletin, "Health of Arc Weldors in Steel Ship Construction," states (page 165): "A total of 496 shipyard workers, mostly weldors, gave a history of having had typical attacks of metal fume fever. . . . It is noteworthy that a history of metal fume fever was observed only among employees exposed to zinc—many weldors exposed to mainly iron fume had never suffered typical attacks of metal fume fever. This strongly suggests that iron or iron oxide fume in the concentrations inhaled by shipyard weldors does not give rise to typical metal fume fever. It has never been shown with any degree of certainty whether or not iron oxide by itself can induce metal fume fever."

There is no indication that metal fume fever can result from that portion of the fume attributable to electrode coatings or welding fluxes; it can, however, result from the composition of or the surface preparation of the metal being welded.

Dr. Gocher believes that lead impurities as well as zinc may play a part in some cases of metal fume fever arising from the welding of galvanized iron. "In one shipyard," he reports, "where an analysis of the air was made down in the hold, lead oxide was found from 5 to 10 mg of lead per cubic meter. . . . Toxic amounts of lead have been found by tests in those who were doing galvanized welding, four such cases being found."

Metal fume fever complicated by lead poisoning is vastly more dangerous to a weldor's health than the simple zinc chills. Hence it is highly desirable that all weldors working on galvanized material be adequately protected. Let's see what the authorities recommend.

Arthur C. Stern, Division of Industrial Hygiene, New York State Department of Labor, says that the principal precaution to be observed is to require air-line respiratory protection when welding is to be done on galvanized steel or zinc-bearing brass or bronze in a confined space. He defines a "confined space" as a volume under 5,000 cu ft. "In other than confined spaces," Stern says, "the prevention of dense welding fume regardless of constituents, as is recommended for welding in general, will usually hold the zinc concentrations to within acceptable limits."

Drinker and Nelson suggest that concentrations of zinc oxide in the air breathed be kept below 15 mg per cubic meter and say that they have yet to hear of metal fume fever being caused at concentrations below 15 mg.

When local exhaust was relied upon to remove the injurious fumes, the usual shipboard practice was to employ a suction blower to which was attached a 4-in. flexible metal tube. The end of this metal tube was held 4 to 5 in. from the crater of the arc. Another 4-in. flexible tube was then attached to the exhaust end of the blower in order to carry the fumes out of the compartment, room or hold and exhaust them into the open air.

A compact, self-contained welding

Air-Fed Helmet

Courtesy Chicago Eye Shield Co.

SUPPLIED-AIR helmet gives a constant flow of fresh air to weldor

fume exhauster now on the market filters the fumes from the exhausted air through twelve filter tubes of fireproofed fabric. Collected fume particles are removed at intervals from the tubes, which are 2 in. in diameter and 18 in. long.

Respirators and Helmets

If there is any possible doubt concerning the protection afforded by general ventilation or local exhaust, weldors of zinc-bearing material should be equipped with respirators. These are of two basic types. One type, approved by the U. S. Bureau of Mines for the removal of "solid dispersoids" given off from heated metals, employs replaceable filters on either side of the wearer's nostrils. These remove zinc and other tiny metallic particles from the air before it can be breathed but are no protection against toxic gases or an insufficiency of oxygen. To guard against either of these dangers, an air-line respirator must be employed—an air mask with a flexible hose, which looks like an elephant's trunk as it dangles from the face of the wearer. Unlike filter-type respirators, the air-line respirator is not convenient to wear beneath the ordinary arc weldor's helmet. Since both types of protection are desired, there was invented the "supplied-air" helmet, a weldor's helmet with an air line. There are two types: one in which air is introduced around the forehead and directed downwards and one in which air is introduced at the chest and directed upwards. Both types keep an atmosphere of fresh air between the helmet and the face while excess air, spilling out around the helmet, aids in preventing fumes from entering under it. This type of protection is well liked by weldors since the fresh air is cooling and the loose helmet is more comfortable than the close-fitting respirator.

Lead Fumes Are Poison

"Supplied-air helmets," states Stern, "can be used effectively in confined spaces where no lead or other specific hazard is known to exist." The flame-cutting and welding (burning) of lead, of lead-painted metals and of lead-bearing metals such as brass or bronze should only be permitted, he thinks, with an air-line respirator.

It is impossible to overstress the hazard of lead fumes. "There is not a single compound into which lead enters that is not capable of doing mischief," declares Taylor's *Principles and Practice of Medical Jurisprudence*. "All lead contamination is objectionable, and no degree of it can be considered safe."

Metal fume fever, which we have briefly studied, may be taken as representative of an acute illness; that is, one that comes quickly to a crisis and is then over. In contrast, lead poisoning is the prototype of a chronic illness, one that extends over a long period. This is because lead is what is known as an accumulative poison; it is removed from the body only with exceeding slowness once it has obtained access to the tissues. Because of the cumulative effect, it is extremely dangerous to be exposed to small amounts of lead every day.

Symptoms of chronic lead poisoning are colic, obstinate constipation, intense headache, loss of appetite, thirst, bad breath and general loss of weight. Another symptom is a peculiar paralysis in which the patient is unable to raise his hand from the wrist. The eyes may also be affected, extending to partial loss of vision. Dr. Gocher reports that lack of vision in one eye occurred in four cases of lead poisoning caused by the welding of galvanized material containing toxic amounts of lead. In none of these cases did the eye condition improve.

Fortunately, lead is not a material that is commonly encountered by many weldors. Lead welding, it might be noted, is also known as "lead burning," a term that goes back to the very early days of the industry when the welding of lead by means of the torch and filler rod, the so-called "burning stick," was a skilled trade in itself that had nothing in common with other welding processes. Lead burning must sometimes be done in the manufacture of lead-lined tanks for the chemical industry, in the fabrication of lead piping and lead pipe fittings and in the manufacture and repair of storage batteries. Even though approved protection is given, it would be wise to keep workers from doing such jobs daily because of the cumulative nature of lead poisoning.

A fairly common industrial application of lead is in terne plate. Terne is an alloy of around 75% lead-25% tin which has much the same oxidation-resistant properties as pure tin. Sheet steel coated with this lead alloy is used for roofing and to make gasoline tanks and caskets.

A minor degree of lead exposure exists in soldering operations. A common solder employed to join small copper wires and make other electrical connections is an alloy of 60% lead, 40% tin. Low-melting-point alloys such as "cerrobend" (87% lead and 13% antimony) also constitute a lead hazard when they are melted and poured in pipe-bending operations.

Perhaps the most widespread exposure to lead poisoning arose during the war in shipyards. It was the usual practice to prime the exposed metal surfaces of merchant vessels with red lead to prevent salt-water corrosion. Though welding was supposed to be done only on unpainted surfaces (the U. S. Maritime Commission specified that a 6-in. strip be left bare on both sides of the proposed weld), a careless weldor impatient to touch up some small job would sometimes let the arc clean the paint off the metal instead of using a wire brush. Nevertheless, the incidence of lead poisoning in shipyards was said to be low.

Dangers of Cadmium

Almost as dangerous as lead is the metal cadmium. Cadmium-plated parts should never be flame-cut or

welded unless the operator is given proper protection. Stern recommends the use of an air-line respirator as in lead burning. An approved filter-type respirator may be considered adequate, however, if the cadmium coating is removed by mechanical or chemical means from the line of weld or cut for a sufficient distance so that it will not be volatilized by the arc or flame.

It may be interesting to note the different behavior of zinc-plated and cadmium-plated materials under the oxyacetylene flame. According to tests made at the research laboratory of The Linde Air Products Co., the zinc on galvanized sheet appears to volatilize as oxide almost simultaneously with the melting. Dense white fumes are given off, which precipitate on the adjacent plate in heavy deposits. It is very difficult to melt the zinc without this heavy fuming. The galvanized sheet after melting is rough and of unsightly appearance.

In contrast to the behavior of zinc, cadmium definitely melts before it volatilizes. Immediately on the application of the flame to cadmium plate, the cadmium agglomerates in molten droplets and then evaporates and oxidizes. All of the cadmium can thus be melted or boiled off the underlying steel, which is left smooth and in good condition. The deposited oxide from the cadmium plate is yellow or brown, as compared with the white color of the zinc oxide.

Schmidt found that the repair of cadmium-plated parts created a rather serious problem in the aviation industry. Such parts were given a magnetic-particle inspection after plating and had to be rewelded if they were found defective. The welded repairs were not supposed to be made until after the cadmium had been stripped from the part by sandblasting it or by dipping it into hydrochloric acid, but this precaution was often omitted in the hurry of high-geared production. Then there would result heavy clouds of cadmium fumes, causing such symptoms as excruciating pain in the chest, distressing cough, dryness of the throat, nausea and vomiting. The toxic effects might even be so severe as to cause sudden death.

A report issued by the Department of Health of Ontario illustrates the symptoms arising from the unwise inhalation of cadmium fumes. The affected worker was engaged in the production of switch boxes on which cadmium-plated levers had to be welded. After welding for a period of three hours, he began to feel a slight soreness in his chest. He attributed this to the presence of yellowish-brown fumes, which he had found somewhat irritating, and reported the matter to his superintendent. The superintendent sensibly put the worker on other duties, but the damage had already been done. All afternoon the soreness in the victim's chest continued to increase; he felt that he was getting influenza. That night, beginning at about eleven o'clock, breathing became very difficult for him and attempts to breathe caused violent coughing. His chest felt "as if it were in a vise." The alarmed family sent for a doctor, but by the time the physician had arrived the patient was experiencing such difficulty in breathing that he was unable to describe his symptoms. A sedative brought some relief. His condition gradually improved, and he went back to work after six days, although he still felt weak and suffered from difficult breathing. The breathing difficulty persisted for several months.

This man recovered from his case of cadmium poisoning, but others have not been so fortunate. Postmortem examinations of the lungs of cadmium victims have revealed edema and congestion of the lungs, hemorrhages into the lungs, damage to kidneys, spleen and pancreas.

The sane way is to be careful. Don't take a chance with either lead or cadmium. Air masks are preferable to postmortems.

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Rectified D-C Welding

As an answer to the demand for d-c welders with the trend towards a-c, Westinghouse Electric Corp. has announced a d-c welder using a full-wave rectifier with a conventional three-phase transformer

BY T. B. JEFFERSON

A NEW WELDING machine hoped and expected to add the advantages of an a-c welder to the desirable characteristics of d-c welding has been announced by the Westinghouse Electric Corp., Buffalo. This new welder combines a three-phase transformer, a three-phase adjustable reactor and a three-phase, full-wave rectifier of the high-voltage plate type.

Welder Components

The transformer is a conventional three-phase transformer, function of which is to supply suitable voltage to the rectifier unit. It is Class B insulated and of open construction. Ventilating ducts are formed into the coils to permit cooling air to circulate.

The adjustable reactor has a wide range and allows for a linear-scale current adjustment throughout the operating range of the welder. On the 300-amp model, current adjustments can be made from 30 amp at 20 volts to 400 amp at 40 volts.

A lightweight, compact selenium cell combination is employed for the rectifier. It consists of six stacks of rectangular cells, arranged in groups and connected in parallel to give full-wave rectification of the three phases. Each of the six stacks of plates is identical for simplicity of assembly and replacement.

In assembly, the three-phase adjustable reactor with control handle and sprocket drive is mounted in an upright frame, mounted, in turn, upon a base assembly. Next, the three-phase transformer is mounted in a similar upright frame, and this unit is also mounted on the base. An air filter is placed beneath the reactor and transformer. The cross supports on the upright frame that hold the transformer in place are used to support the selenium rectifier unit. An exhaust fan, powered by a 1/12-hp prelubricated enclosed motor, is mounted in the welder. Air drawn by the exhaust fan is directed by baffle plates through an opening in the base, through the filter, through the reactor and transformer windings, through the rectifier unit and out the side of the cabinet.

The Finished Job

Physically, the welder consists of a streamlined cabinet that, for the 300-amp rating, is about 2 ft square, 3½ ft high and weighs only 510 lb or about 40% as much as a motor-generator welder of comparable rating.

The low center of gravity (by virtue of the bottom location of the transformer and reactor) makes the welder as readily transportable as the conventional horizontal-type motor-generator welder. The lack of rotating parts (except for the small ventilating fan) renders it nearly noiseless. This is a particularly advantageous feature for installations where large groups of machines are assembled together or for installations where the operator is working close to the machine.

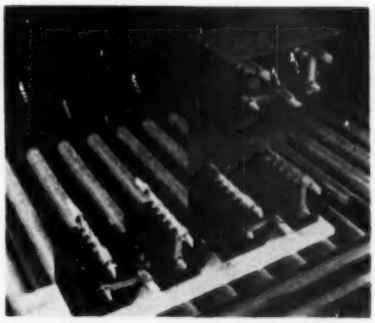
Efficiency at rated load is said to be 66% as compared to 54% for an average motor-generator welder. This efficiency increases at reduced load conditions and reaches 73% at 20% rated load. The power factor at normal operating load conditions is comparable to that of induction-motor-driven welders.

Experience has indicated that the average welding machine is idle about two thirds of its operating time. As compared to the conventional motor-generator welder, the new welder is stated to have a greatly reduced no-load power consumption. The no-load loss of the 300-amp welder is only 500 watts as compared to 2,480 to 3,600 watts for a conventional welder. Likewise, the no-load kva input of the new welder is only 0.67 as compared to 7.1 to 7.7 kva for a typical motor-generator welder.

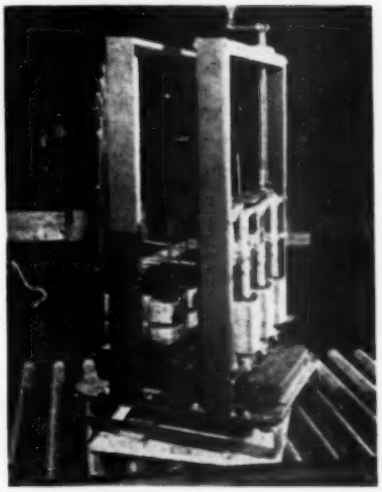
This welder also offers desirable welding characteristics, one of which is an extremely rapid response to the changes in current and voltage conditions produced by the welding arc. Because of the negligible inductance in the d-c circuit, the time constant of this welder is very small. Consequently, overshoots and undershoots resulting from changes in load requirements are small and of short duration. The time of recovery is about 0.007 seconds from rated load to short circuit or vice versa. The average motor-generator welder requires considerably more time to reach a steady-state condition during normal operation.

Operation is said to be especially good when welding is done at low current densities.

The small 360-cycle ripple component in the d-c output results in a somewhat reduced arc blow in comparison with the unvarying direct current from a rotating generator.

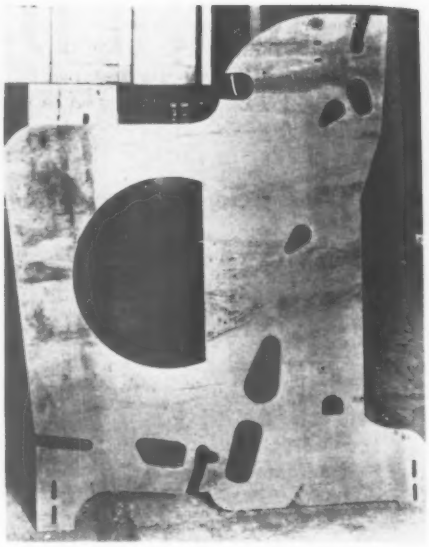


SELENIUM RECTIFIER, shown as partially assembled, consists of six stacks of rectangular cells



THREE-PHASE adjustable reactor and transformer mounted on welder base with air filter beneath them

1—SHAPE-CUTTING side frames for a textile feeding machine is done at the steel warehouse. Three frames are cut from one big ⅜-in. plate



2—FINISHED FRAME of woolen card feeder shows the intricate cuts required

Custom-T

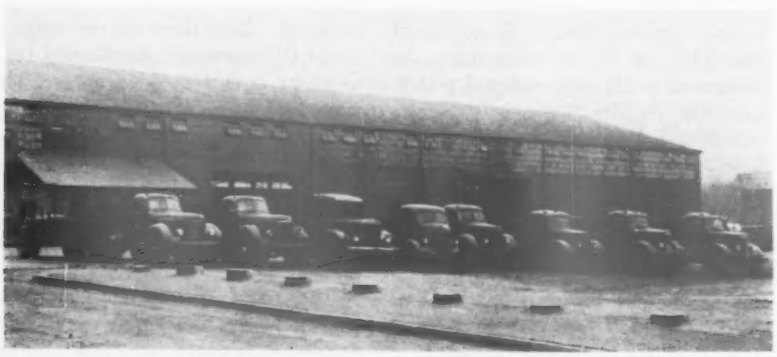
Manufacture of textile feeding machines by Geo. S. Harwood & Son, Worcester, starts at a steel warehouse, where ⅜-in. plates are flame-cut into completed side frames before delivery to customer

BY A. S. BLODGET, JR.
Air Reduction Sales Co.

THE PART played in America's overall production picture by the 1,200 steel warehouses in the United States often goes unheralded because these warehouses never deal in the finished product. They are instead a sort of huge supermarket for servicing of industrial manufacturers.

A typical steel warehouse maintains a stock of over 5,000 shapes, sizes and kinds of steel. This often involves an inventory of from 15,000 to 20,000 tons of steel. Recent figures reveal that this nation-wide chain of 1,200 warehouses annually receives over 17% of all the steel produced in this country.

A steel warehouse does far more than provide a storage bin for steel. An example of what it can and does do is found in the manufacture of textile feeding machinery by Geo. S. Harwood & Son, Worcester, Mass. The manufacture of these machines does not start in the Harwood plant but in one of the Worcester shops of the Merrill & Usher Co., a large New England steel warehouse.



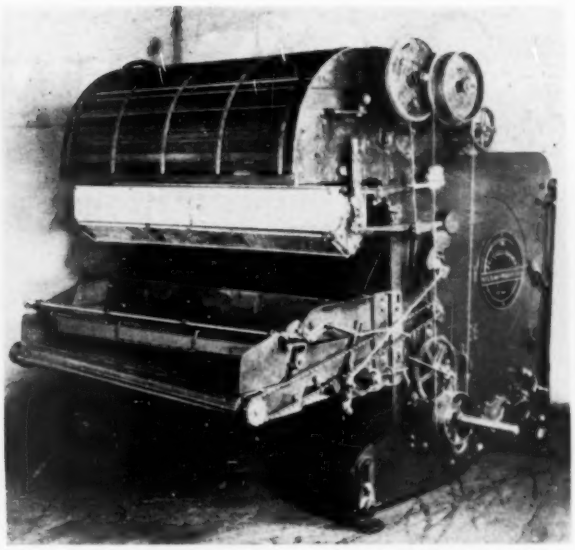
5—TO SPEED "SPECIAL DELIVERY" steel to customers throughout the New England area, Merrill & Usher maintains a fleet of over twenty trucks

Side Frames Shape-Cut

A 100 by 274 in. plate of ⅜-in. thickness is "taken down from the shelf" and shape-cut by machine (Fig. 1) to form the side frames for the Type B-4 Harwood Bramwell woolen card feeder. Three main frames can be obtained from the 100 by 274 in. plate. That the cuts are anything but simple can be seen from Fig. 2, a close-up of a completed side frame.

The intricate cuts required for this job pose no problem to the highly skilled flame-cutting operators. To them, it's just part of a day's work—part of the steel warehousing business. Equipped with the most ex-

3—SUPPLEMENTARY PARTS are now arc welded to the side frame at shop of a local welding subcontractor



4—COMPLETED FEEDER will deliver uniform amounts of wool or similar fibres to a woolen carding machine

n-Tailored Steel

tensive cutting facilities in New England, Merrill & Usher is able to supply customers with precision-cut rings, disks and irregular flame-cut shapes of every description.

After leaving the warehouse, the main frames for the textile feeding machine go to a subcontractor, The Ken-Weld Co., which cuts supplementary parts and welds them to the frame (Fig. 3). Finally, the semi-assembled side frame is delivered to Geo. S. Harwood & Son, where the woolen card feeder illustrated in Fig. 4 is manufactured. It is the function of the completed machine to weigh out automatically a continuous succession of small batches of wool or similar fibres and to deliver them in a highly uniform manner to a woolen carding machine.

6—STEEL HANDLING at Merrill & Usher's Worcester warehouse is done by two 25-ton cranes, which cover the 300-ft-deep storage and cutting bay

Steel as They Want It

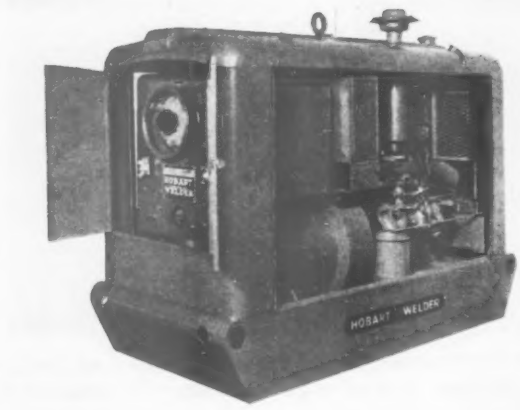
From its wide stock of hot-rolled and cold-finished steels in bars, plates, merchant-size bars and shapes, strip shapes and tube, Merrill & Usher delivers steel to manufacturers in just the way they want to receive it in any quantity from a few pieces to a carload.

To speed "special delivery" steel to manufacturers located throughout the New England area, Merrill & Usher operates a fleet of over 20 trucks (Fig. 5). Steel handling at one Worcester warehouse is accomplished by means of two 25-ton cranes which cover the 300-ft-deep storage and cutting bay. One crane is illustrated in Fig. 6.

Since service is so important a factor in its business, Merrill & Usher has a staff of sales engineers to explain how the facilities of a steel warehouse can be applied to individual jobs. In most cases, these engineers are able to work directly from customer's blueprints.

New products f

PUSH-BUTTON WELDING of light stainless steel claimed for new bench spot welder. Electronic circuit gauges amount of heat needed



ENGINE-DRIVEN d-c arc welder has current range of 25 to 230 amp at 25 volts. 100 steps of volt-ampere adjustment are available

Bench Spot Welder

FOR USE with lightweight stainless steels, the "Unimatic" spot welder can be operated by the pressing of a single button, its maker claims. A sensitive electronic circuit gauges the amount of heat needed to bond the workpieces through a range of thicknesses.

This welder is quite compact, measuring 9½ by 6½ by 4¼ in. It operates on 110-120 volt a-c current of 60 cycles. Special models are available for other current sources.

UNITEK CORP., 697 North Lake Ave., Pasadena 6, Calif.

* * *

Brazing Rod

FLUXCOATED brazing rod, Agile No. 200, is claimed to give an extremely clean joint that is free of the vitreous slag usually found in such work. Coated for its entire length of 18 in., the new rod comes in ⅛, 3/16 and ¼ in. diameters.

Production is increased 12 to 18%, manufacturer claims, because the coating eliminates the continuous dripping of the bare rod into the flux container. Melting point of the rod is 1,596 deg.

AMERICAN AGILE CORP., 5806 Hough Ave., Cleveland 3.

* * *

A-C/D-C Electrode

DESIGNED for uphand welding and poorly fitted joints, "EutecTrode 6000" permits use of high current with fast welding speeds. An a-c/d-c electrode, it is coated with "FrigidArc" coating to permit welding at low heat.

It is recommended for wrought iron, angles, shapes and castings. Rapid solidification of the weld metal is claimed to aid vertical and overhead welding.

Diameters available are 3/32, ⅛, 5/32 and 3/16 in. Makers claim the as-deposited metal has a Brinell hardness of 200 and a high tensile strength of 64,000-72,000 psi.

EUTECTIC WELDING ALLOYS CORP., 40 Worth St., New York City 13.

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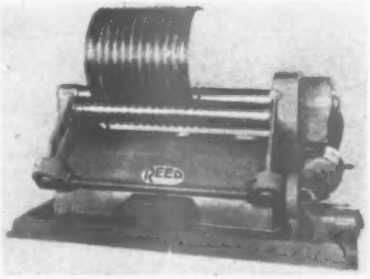


CULVERT pipe, grain bins and roof panels produced by Reed corrugated rolling machine

Rolling Machine

FOR rolling corrugated sheets into circular and semi-circular roof panels, culvert pipe, grain bins and related items a new rolling machine has three corrugated shafts which can be designed to any standard corrugation.

Called the Series 600, each machine is equipped with power adjustment on the rear forming roll to establish the curvature of the sheet. They are also equipped with an air-operated drop-end which permits quick removal of fully rolled circles.

The machine is fitted with bronze bearings throughout and a totally enclosed silent worm-gear drive. Rating of the driving motor is 5 hp with a 1½ hp auxiliary motor for adjusting the rear roll. Approximate overall dimensions are 40 by 102 in.

THE REED ENGINEERING CO., 1003-17 West Fairview Ave., Carthage, Mo.

Engine-Driven Welder

A MEMBER of the Hobart "Bantam Champ" line, a new gasoline-engine-driven d-c welder, Model ZXB-200-S, is rated at 200 amp at 25 volts on 50% duty cycle. Current range is 25 to 230 amp at an operating speed of 2,200 rpm. Dimensions are 55 by 22 by 38½ in. Weight is 770 lb.

Five ranges of welding current and 100 steps of volt-ampere adjustment are provided in each range, making available 500 combinations of open-circuit voltage and welding current. The main switch is of heavy copper, moulded in Bakelite and controlled by a large hard-rubber-cover hand wheel.

The generator is a modified multirange type with four laminated main poles and four removable interpoles. It is driven by a Hercules ZXB, four-cylinder industrial engine equipped with oil-bath-type oil filter, gasoline filter and muffler.

* * *

Sealing Compound

TWO NEW metallurgical products, "Flawmaster" and "Bonding Agent R-313" are offered for the prevention of porosity in metal parts. Both are applied by hand, without intricate machinery being necessary.

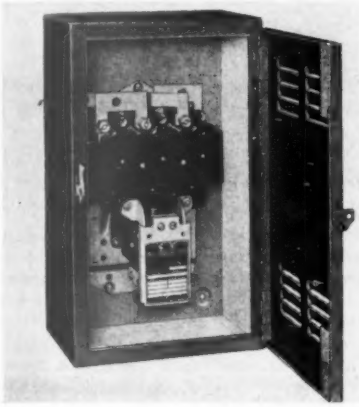
"Flawmaster" is a thermosetting compound used to reclaim metal parts and castings otherwise rejected for surface flaws, sand pitting, foundry gas holes, faulty machine surfaces, etc. It is machinable, chemically inert and resistant to a wide range of temperatures.

"Bonding Agent R-313" manually bonds dissimilar and similar materials such as glass, plastics, Neoprene and leather to metals and ferrous to non-ferrous metals.

WESTERN SEALANT, INC., 9042 Culver Blvd., Culver City, Calif.

ts for welding

A small bench spot welder, an engine-driven d-c welder and a flux-coated brazing rod lead November's New Products. Lug connectors that don't tear stranding are also announced



RUGGED contactor for small spot welders features easy inspection and maintenance

Welder Contactor

LONG LIFE and high speed operation are claimed for the new Square D size OW, 50-amp welder contactor. This product is for installation in spot welders having capacities up to 10 kva, 220 volts, or 20 kva at 440 volts.

High rupturing capacity is assured by two double-break contacts connected in series, giving a total of four breaks. Heavy copper bus straps allow large welder cables to be easily connected and are conveniently located for accessibility.

Accessibility for inspection and maintenance is said to save time and labor. Using only a screwdriver, an operator can remove for inspection or replace the movable contact assembly, terminals, contacts and magnet coil.

SQUARE D CO., INDUSTRIAL CONTROLLER DIVISION, Milwaukee 12.

* * *

SPEAR in new cable connector wedges cable strands into retainer nut without tearing

Lug and Cable Connector

A NEW welding lug and cable connector has a detached and separate spear that wedges the cable strands into the retainer nut without use of solder. The strands cannot be torn because the spear point does not turn when lug is screwed or unscrewed.

The lug can be left on the cable and used from holder to holder or from one machine to another. It is quickly and easily installed with a wrench.

The "Perfecto" lug is claimed to minimize overheating, corrosion, arcing, breakdowns, lost time and disrupted schedules. It underwent two years of rigid tests before being put on the market, states manufacturer.

PERFECTO LUG AND CABLE CONNECTOR Co., 2640 West Van Buren St., Chicago 12.

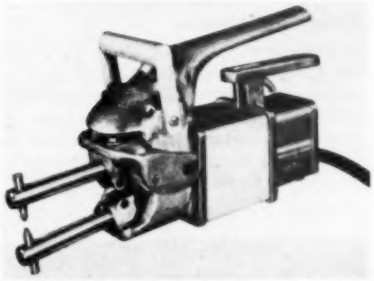
* * *

Dust Collector

IMPROVEMENTS on the Model 420 "Dustkop" dust collector permit its use on grinding operations involving larger wheels and bigger volumes of dust than formerly, its manufacturers claim. No increase in floor space or in overall height are involved.

The higher rating is due to a 1/3 hp motor direct driving a special paddle wheel fan. The increased capacity of the Model 420 allows its use with two grinding wheels up to 7 in. diameter, one polishing or buffing wheel up to 10 in. diameter or one 9 in. grinding wheel on production grinding. AGET-DETROIT Co., Ann Arbor, Mich.

REMOTE CONTROL UNIT (inside circle) for use with Westinghouse a-c welders permits the operator to change the current setting without walking back to the machine. He simply presses either the "Raise" or "Lower" button, and a small motor moves the core to make the adjustment. This handy gadget is not yet commercially on the market



PORTABLE WELDING TONGS can handle up to ⅛ in. combined thickness of steel

Portable Spot Welder

FOR WELDING stainless and mild steel up to a combined thickness of ⅛ in., a new portable 23¼ lb tong welder has been designed. It is offered for spot welding in factories, garages, auto repair shops, home hobby shops, etc. Operation is on 220 volt a-c lines, single phase, 50/60 cycle.

The "Sureweld" welder may be purchased with tips set at either a 90-deg or a 45-deg angle. A telescopic tong is also available for reaching into restricted spaces.

NATIONAL CYLINDER GAS Co., 840 North Michigan Ave., Chicago 11.

* * *

LARGER radius on saddle permits unrestricted water flow in welding cables

Cable Saddle

IMPAIRED water flow can cause excessive heat and deterioration to resistance welding cables. New improved cable saddles are claimed to permit completely unrestricted water flow and also to eliminate localized bending and minimize cable breakage.

Design of saddle is said to distribute weight of portable welding gun and cable over a large area.

This improved saddle is movable so that the welding gun may balance itself for easy maneuverability. It is made from aluminum and has a forged steel eye.

OSBORN MFG. Co., Warsaw, Indiana.

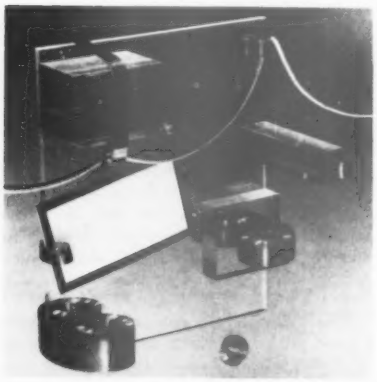
BLADE-TYPE holder has crown-type jaw insulators. Holds up to ¼-in. electrode

Electrode Holder

A BLADE-TYPE insulated electrode holder, the Jackson Model BT-3, is claimed to be cool working, safe and economical. It has crown-type jaw insulators, said to be strong and heat-resistant. Capacity of the holder is ¼ in. electrodes at 300 amp.

JACKSON PRODUCTS, Warren, Mich.

* * *



COIL-SPRING clamp can be used for holding odd-shaped forms or as guide for cord

Coil-Type Clamp

A UNIQUE industrial clamp called the "Neg'ator" utilizes the spring action of a prestressed spring coil. Advantages are said to be automatic take-up, constant clamping pressure, large dimensional range between clamp head and extreme flexibility in locating clamping pressure.

Currently available sizes range in width from ¼ to 2 in. and cover a range of clamping pressures from 2 oz to 20 lb in eight increments.

The clamp is formed from a spring coil by winding off about half the length into a second coil. The two coils are then connected by a straight section of metal. The force between them is developed because the ends of the straightened section try to return to the natural coil form.

Over and above the clamping properties of the device, the coil form of the heads can be utilized as guides for keeping welding cable or temporary wires off the floor.

HUNTER SPRING CO., 1 Spring Ave., Lansdale, Pa.

* * *

Blow Torch

SEVERAL improvements for more safety and efficiency are incorporated in a new blow torch, Model 330 S. These include a shut-off valve equipped with a replaceable needle pin which is claimed not to break off and clog the blow torch. A small spring on the pump plunger washer keeps the washer spread for positive pumping action. The fuel line from the tank to the burner is equipped with a mesh strainer control to prevent flashback.

Other features include a strong, ribbed reinforced bottom, a heavy steel priming cup and a long undervein with cleanout plug. The Model 330 S is refueled by removing the pump while the Model 330 BS is filled through a funnel-shaped bottom equipped with a filler plug. Both models have one quart capacity.

P. WALL MFG. CO., 472 Erie St., Grove City, Pa.

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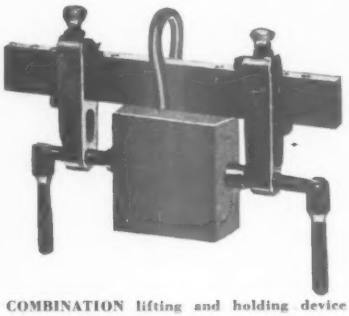


COMBINATION lifting and holding device replaces chains and clamps in welding shop

Lifting Tool

PUGEL ENTERPRISES, INC., 3746 Kelley Ave., Cleveland 14, O., has recently manufactured a combination lifting and clamping device called the Gonser "Grizzly Lifter" to facilitate the handling of weldments, motor blocks, castings, etc. The tool can likewise be used as a jack, jig or clamping fixture. Its use is said to eliminate the need for chains, ropes, slings, pinch bars and C-clamps.

* * *

FIBERGLAS hat for construction workers has high strength, withstands radiant heat

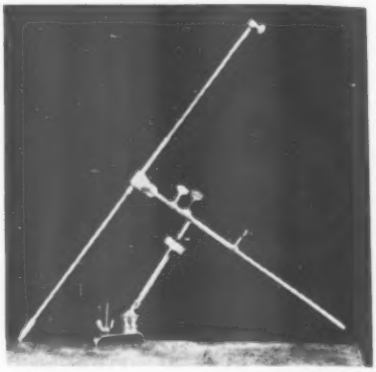
Glass Hat

CROWN for a new "hard-boiled hat" is made of impregnated Fiberglas that has been tested for strength and resilience. This material is claimed to be impervious to moisture and acids, to pass all dielectric tests, to be non-shattering and non-deteriorating and to provide a superior resistance to radiant heat.

Standard colors are white and grey but other colors may be produced, including a pigmented hat that glows in the dark for tunnel workers or night construction crews. An adjustable sweatband fits all head sizes.

E. D. BULLARD CO., 275 Eighth St., San Francisco 3.

* * *



MARKING of openings, ducts, angles is said to be easy with the SMW pattern maker

Pattern Maker

NEW pattern-making instrument for sheet-metal workers and fabricators of piping systems is claimed to solve most problems they encounter in their work in a matter of minutes. It is said to readily mark out cutting openings and other joining lines required to fit round or square, tapered, straight or odd-shaped ducts into round or otherwise-shaped openings on flat, curved or off-center surfaces.

Essentially, the instrument is a modified parallel-leg compass with an adjustable radius bar. The scribe-leg slides in a bearing on the radius bar to project desired shapes onto any surface. As a projecting instrument it is universal.

E. A. SCOTT, 45 West 45th St., New York.

* * *

HIGH-SPEED grinder for ½ in.-diameter grinding wheels operates at 75,000 rpm

Small Grinder

A NEW 15-oz pneumatic grinder operates small-diameter grinding wheels of ½ in. and smaller at a speed of up to 75,000 rpm. Its compact construction makes it an easily handled tool for grinding in close quarters.

An inverted throttle lever provides operating control. Standard spindle collet accommodates mounted grinding wheels with ⅛-in. diameter shanks. Optional equipment includes spindles with 3/16 or ¼ in. capacity collet chucks.

KELLER TOOL CO., Grand Haven, Mich.

* * *

Electrode Insulators

JACKSON PRODUCTS' entire line of insulated arc welding electrode holders is now being furnished with improved jaw insulators at no change in price.

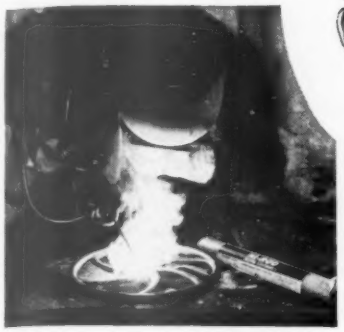
Made of laminated Fibreglas with melamine binder and other heat-resistant material they are claimed to be five times stronger than those originally furnished.

JACKSON PRODUCTS, Warren, Mich.

"Welding cast iron is EASY with NI-ROD"

says Jim Bengough

"I've been welding for 20 years and never thought it possible to get an electrode to work as well on cast iron as Ni-Rod does."



WELDING A CREAM SEPARATOR WHEEL. With Ni-Rod electrodes, no preheating was necessary, so distortion was kept to a minimum. The wheel hub was welded, and broken gear teeth were built up.

FILING WELDED GEAR TEETH. After building up broken gear teeth with Ni-Rod, only hand filing was required to put the wheel into usable condition.

HAY PRESS BULL PINION SAVED BY NI-ROD. A broken section was built up with Ni-Rod and ground to shape after welding.

Experienced welders—like Jim Bengough of Hensall, Ontario—recommend Ni-Rod for welding cast iron because Ni-Rod is both dependable and easy to use.

Serious breakdowns in farm machinery often call for welding cast iron parts . . . frames, broken gear teeth, wheel spokes, hitch links. With Ni-Rod* on hand, you can get laid-up machines back on the job sooner, even if you are not an expert welder.

Ni-Rod gives a stable arc in any position on either AC or DC. Preheating and post heating are seldom necessary. And Ni-Rod gives you welds that are machinable without special tools or techniques. Hand filing is often all that is needed to put a Ni-Rod welded part back in service.

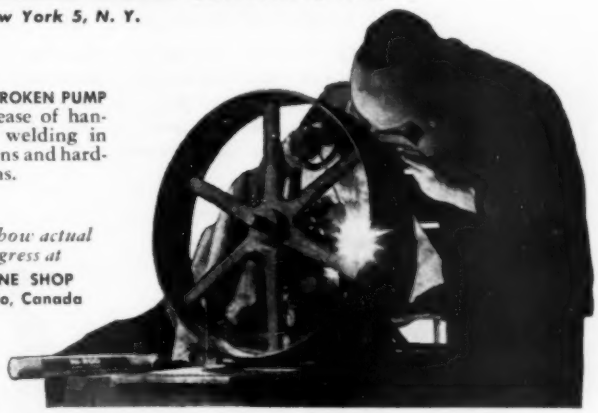
Be ready to make quick, *dependable* repairs by ordering a package of Ni-Rod today. Your nearest INCO distributor stocks Ni-Rod in 3/32", 1/8", 5/32", and 3/16" sizes.

For complete information about INCO's welding materials, send for the latest catalog. *Reg. U. S. Pat. Off.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

NI-ROD REPAIRS BROKEN PUMP JACK. Ni-Rod's ease of handling simplifies welding in awkward positions and hard-to-reach locations.

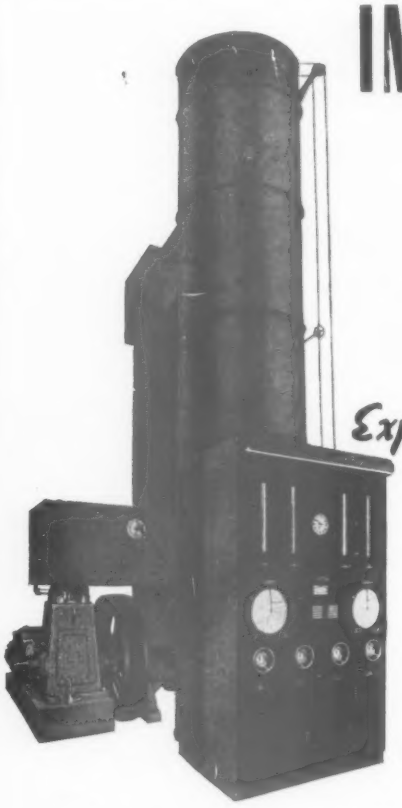
Photographs show actual jobs in progress at
JIM'S MACHINE SHOP
Hensall, Ontario, Canada



EMBLEM OF SERVICE
INCO MONEL TRADE MARK

NI-ROD DISTRIBUTORS

Alloy Metal Sales, Ltd.	J. M. Tull Metal & Supply Company	Whitehead Metal Products Company, Inc.
Robert W. Bartram, Ltd.	Pacific Metals Company, Ltd.	Wilkinson Company, Ltd.
Eagle Metals Company	Steel Sales Corporation	Williams and Company
Metal Goods Corporation		
Metal & Thermit Corporation	**National Cylinder Gas Company**	**Hollup Corporation**



INDEPENDENT

Gas Producing

PLANTS

Expansion Engine Type —Medium Pressure

OXYGEN & NITROGEN

Producing Plants

Built in standard sizes as listed below in single and double rectification units. Streamlined panel provides quick visibility of all gauges. Compact design—requires minimum of floor space.

SIZES IN METERS AND CUBIC FEET

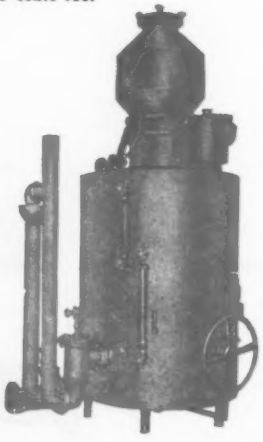
15 Meters or 530 cubic feet	75 Meters or 2650 cubic feet
30 Meters or 1060 cubic feet	100 Meters or 3530 cubic feet
40 Meters or 1412 cubic feet	150 Meters or 5300 cubic feet
55 Meters or 1940 cubic feet	200 Meters or 7060 cubic feet

Larger sizes also available

LOW PRESSURE

ACETYLENE GAS

PRODUCING PLANTS



This 600-lb. Acetylene generating Plant is one of the safest plants manufactured. Automatic controls minimize the operating personnel. Capacity 2700 cu. ft. per hour. Generator only is illustrated. Affiliate units are designed to insure maximum production at minimum costs. Complete details of construction and plant layout on request.

We Invite YOUR Inquiries

INDEPENDENT ENGINEERING COMPANY, Inc.

Manufacturers of

CONSULTING · DESIGNING · RESEARCH

CYLINDERS AND GAS PRODUCING EQUIPMENT
ACETYLENE · OXYGEN · HYDROGEN · NITROGEN

O'FALLON 5, ILLINOIS

FLEXIBLE rubber facepiece keeps M.S.A. mask gas-tight against harmful dusts

Dust Mask

RESPIRATORY protection against nuisance and harmful dusts is provided by the M.S.A. all-vision dust mask. This product is fitted with a flexible all-rubber facepiece that conforms snugly to the facial contours to effect a comfortable gas-tight seal. Easily adjusted head bands secure the mask to the head without binding.

The mask is equipped with a large-area disposable filter, said to have low resistance to breathing, and large lenses that permit a natural wide-angle vision. Lenses are protected from fogging by inner air deflectors.

MINE SAFETY APPLIANCES CO., Braddock, Thomas and Meade Sts., Pittsburgh 8.

• • •

Cast Iron Electrode

FOR WELDING operations on all five types of the "Ni-Resist" series of high alloy cast irons, The International Nickel Co. has developed the "Inco 101" welding electrode. It is claimed to have a good color match and to be as machinable as the parent metal.

Corrosion resistance of the weld deposit is claimed to be as good or better than "Ni-Resist." Strength of the weld deposit is 55-60,000 psi with 8% elongation.

Moderate preheating (150-250F) is helpful in reducing the cooling rate, especially in cold weather operations out of doors.

THE INTERNATIONAL NICKEL CO., INC., 67 Wall St., New York City 5.

• • •

Hydraulic Fittings

NEW line of Parker "Triple-lok" tube fittings comprises 477 shapes and sizes. Specially designed to meet the Joint Industry Conference Hydraulic Standards for Industrial Equipment, the fittings also have passed army-navy specifications.

The "Triple-lok" is a three-piece flared fitting incorporating a sleeve which acts as a lock-washer, damps vibration and prevents wiping of the flare during make-up. A 37-deg flare angle is also in the design, which include dryseal pipe thread. All parts are made from steel and stainless steel types are also available. Sizes range from ⅛ in. tube OD, ⅛ in. pipe thread to 2 in. tube OD and pipe thread. THE PARKER APPLIANCE CO., 17325 Euclid Ave., Cleveland 12.

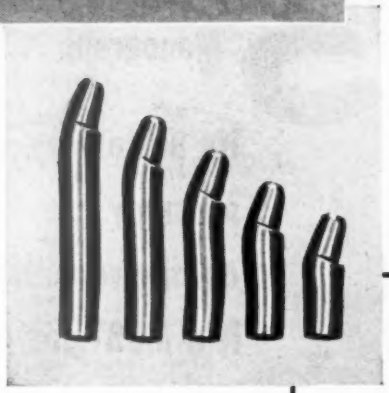
(*Continued on Page* 81)

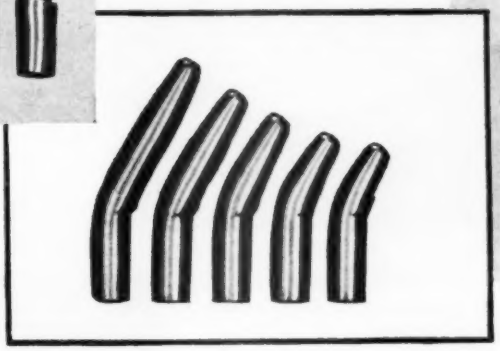
SPECIAL ANNOUNCEMENT FROM RESISTANCE WELDING ELECTRODE HEADQUARTERS

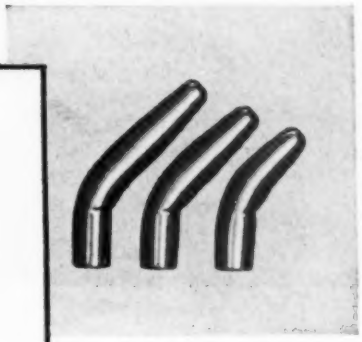
New

Mallory Single Bend Tips...

Developed to replace irregular forged or cast tips







Single bend tips can be supplied with bends of varying degrees from 0° to 45° and in varying over-all lengths at minimum costs. Illustrated is a cross-section of the many combinations of angles and over-all lengths available.

Tips made from rod stock possess superior physical and mechanical properties over tips made from castings or forgings. Mallory research and engineering have now developed single bend tips, *cold-formed* from standard, stocked, straight tips which may be used as replacements in gun or special applications where forged or cast tips are being used. Single bend tips also bring the cooling water closer to the welding face.

These new Mallory Single Bend Tips will stand greater impact . . . increase number of welds between dressings . . . give more uniform welds . . . *assure longer tip life*. And, they cost you less than cast or forged tips!

Mallory Single Bend Tips are available in #1 and #2 Morse Taper, and can be supplied with a bent welding face angle varying from 0° to approximately 45°.

Send details of your application or electrode requirements. Let us recommend the proper tip for your job.

In Canada, made and sold by Johnson Matthey & Mallory, Ltd., 110 Industry St., Toronto 15, Ontario.

Resistance Welding Tips, Holders, Dies, Rod and Bars, Castings, Forgings

P. R. MALLORY & CO. Inc.

MALLORY

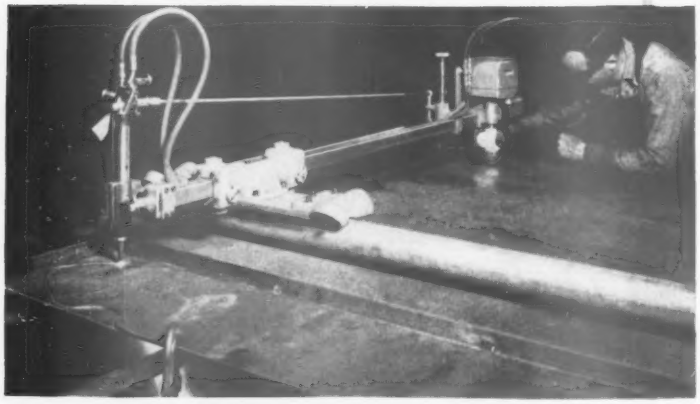
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

SERVING INDUSTRY WITH

Capacitors — Rectifiers
Contacts — Switches
Controls — Vibrators
Power Supplies
Resistance Welding Materials

"We can't say enough about Airco's NEW No. 3 Monograph . . . its portability, accuracy and shape cutting versatility make it a MUST for every metal working shop..."

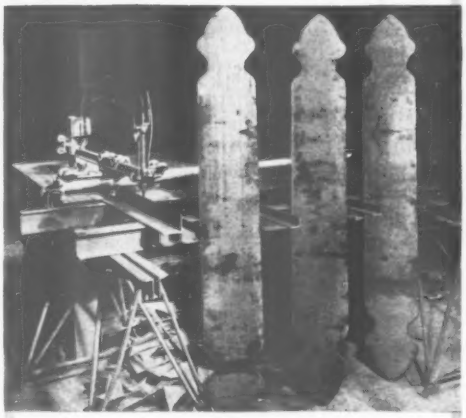
Says Mr. J. C. Hustad, President
Hustad Company, Minneapolis, Minn.



Used for machine gas cutting of special structural shapes at Hustad, the Airco No. 3 Monograph has more than proved its ability to meet the demand for straight line, circle and bevel cutting, with an extremely high degree of accuracy.

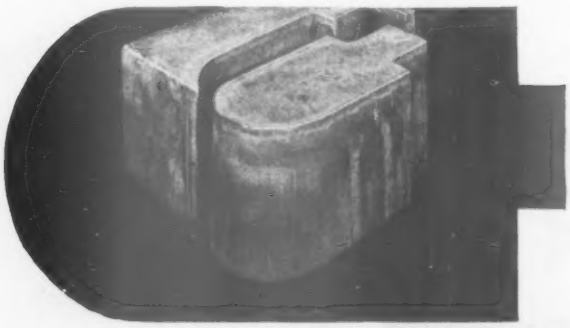
Further, with a cutting area of 32 inches by 56 inches, it gives excellent results in cutting most any steel shape up to 8 inches thick . . . and a 6-foot 8-inch rail can be added, extending the cutting area indefinitely.

This NEW machine is the lowest priced machine of its type in the field (only $695, including a manual tracing device, torch, tip, tubular rail, hose and carrying case). Also, it is portable—the machine itself weighs but 110 lbs. and the tubular rail 35 lbs. The entire unit is packed in a carrying case which can be conveniently handled by two men.



SPECIAL TRIAL OFFER
(Good in Continental U.S.A. Only)

If you would like to try this machine for two weeks *in your own shop on your own work*, just drop a letter to your nearest Airco office or authorized Airco dealer and they will advise you how a shop-trial can be arranged . . . or, if you would like a descriptive folder (ADC-660) they will be glad to send you a copy.



This shows a clevis for a steel mill guide cut from 6" plate—note the smoothness of the cut, reducing considerably machining cost and time.

AIRCO AIR REDUCTION
Offices in Principal Cities

Headquarters for Oxygen, Acetylene and Other Gases . . . Calcium Carbide Gas Cutting Machines . . . Gas Welding and Cutting Apparatus and Supplies . . . Arc Welders, Electrodes and Accessories.

What's the right X-Ray film?

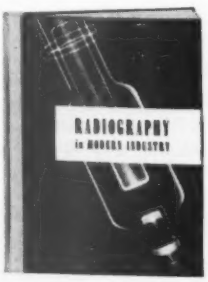
Product:
Pressure vessel
Material:
Cold rolled steel,
1-1/4 inches thick
Equipment:
200-kv x-ray unit
Remarks: RUSH

ANSWER:

KODAK INDUSTRIAL X-RAY FILM, TYPE K

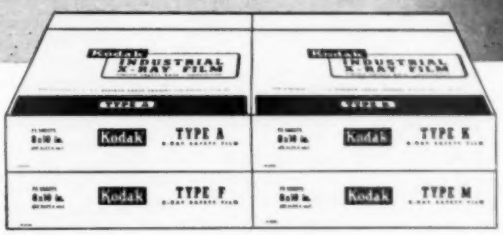
The wall of the tank was thick—the kilovoltage available was low. And the customer was impatient for delivery. So the radiographer did this job with Kodak Industrial X-ray Film, Type K.

This film, in contact with lead foil screens, has sufficiently high speed to allow reasonable exposure with equipment of moderate power. The good definition so obtained is added assurance that significant weld irregularities will not be missed.



RADIOGRAPHY IN MODERN INDUSTRY

A wealth of invaluable data on radiographic principles, practice, and technics. Profusely illustrated with photographs, colorful drawings, diagrams, and charts. Get your copy from your local x-ray dealer—price $3.00.



A TYPE OF FILM FOR EVERY PROBLEM

To provide the recording medium best suited to any combination of radiographic factors, Kodak produces four types of industrial x-ray film. They furnish the means to check welds efficiently and thus extend the use of the welding process.

Type K has medium contrast with high speed. For gamma ray and x-ray work where highest possible speed is needed at available kilovoltage without calcium tungstate screens.

Type F provides the highest available speed and contrast when exposed with calcium tungstate intensifying screens. Has wide latitude with either x-rays or gamma rays, exposed directly or with lead screens.

Type M provides maximum radiographic sensitivity, high contrast, and exceptional detail under direct exposure or with lead foil screens. It has extra fine grain and the speed is adequate for examination of light alloys at moderate kilovoltage and for much million-volt radiography.

Type A offers high contrast with about three times the speed of Type M, but with slightly more graininess. Used direct or with lead foil screens for study of light alloys at low voltages, and of heavy steel parts at 1000 kv.

Radiography...

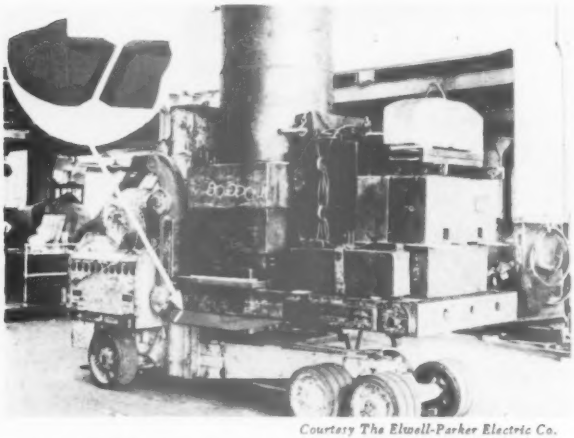
another important function of photography

EASTMAN KODAK COMPANY
X-ray Division · Rochester 4, N. Y.

"Kodak" is a trade-mark

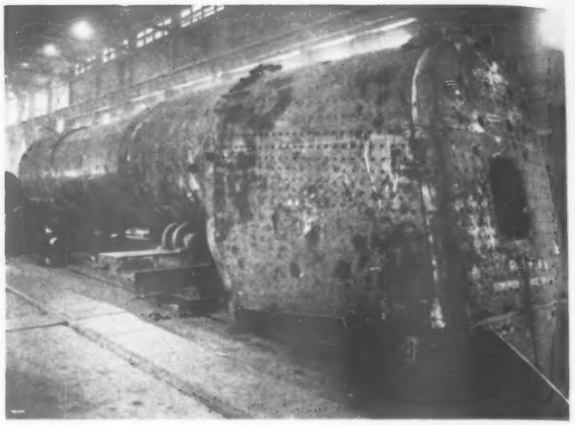
Kodak

on the job



Courtesy The Elwell-Parker Electric Co.

POWER TRUCK handling heavy dies broke on both sides at point indicated by arrow. Inset shows how parts were prepared for welded repair



Courtesy Dominion Bridge Co., Ltd.

LOCOMOTIVE BOILERS of welded construction are built for Canadian Pacific Railways to reduce the cost of conventional riveted boilers

Mending Heavy Castings

By J. A. Draxler

AN ELECTRIC power-truck die handler in an auto body stamping plant was the victim of a freak accident, in which both arms supporting its platform were broken off at their elbows. The arms are chrome-moly steel castings, each 13 in. wide by 3½ in. thick and weighing 1,750 lb. Horizontal portions of the arms are the main supports for the platform, one under each side, while the perpendicular lengths are attached to the elevator mechanism in the truck's upright columns.

Each of the arms had broken off cleanly in about the same diagonal line across the elbow. Apparently, there was no flaw in the castings; they had simply reached the limit of overstress. The truck's rated capacity was 25 tons, but it had been used regularly for 40 to 50 ton loads prior to the breakdown and occasionally for 60 ton loads. The accident occurred while the truck was being used in conjunction with an overhead crane to move a 125-ton stamping press.

To make new castings corresponding to this 1935 model and to rebuild the platform would have taken three to four months. The cost was estimated at $3,000. Welding was the only alternative, and the truck was rushed to the maker's factory for the repair.

First, certain retaining and connecting plates were replaced, and clamps and bracing were used to hold the entire platform assembly firmly together. Lower connecting pins were released, permitting the platform to be swung out and away from the truck's upright columns.

Next, the edges of the fractures were beveled down to 45-deg angles to make two opposing V's with points ⅛ in. apart. To weld the chrome-moly steel, an electrode was selected of composition: carbon 0.30-0.40%; manganese 1-1.25%; molybdenum 0.30-0.40%.

The welding was done carefully to distribute heat and metal. Two weldors were employed, one operating on each side of an arm. Two beads were welded along one side of the open V-shaped cut, then two along the other, each weldor operating alternately to prevent warpage. A total of 40 lb of metal was deposited to weld each of the two fractures. Outer surfaces were rounded off as smoothly as possible in the welding operation, but they were not ground down. Maximum thickness of the welded area was 4 in.

A series of loading and operational tests conducted at the factory indicate that the welds are fully as resistant to overload and shock as the original castings. Practical use will prove this, as the truck is back in the body plant again handling overloads. Its time out of service was one week, and the cost of the repair job, including replacement of broken angle plates, was around $800—about a fourth of the cost and a twelfth of the time that would have been required if new parts had been ordered.

* * *

Welded Penstocks

FOUR HUGE steel penstock pipes, each 13½ ft in diameter and 426 ft long, are being fabricated at the Bureau of Reclamation's Hungry Horse project in northwestern Montana (see front cover illustration). The penstocks will carry up to 80 tons of water per second to each of the four 105,000-hp turbines that will be installed in the Hungry Horse power plant to convert the energy of the South fork of the Flathead river into hydroelectric power for the Pacific Northwest.

Large spiders consisting of steel collars and bolts are placed in the penstock sections to maintain proper curvature of the steel plates and to assure accurate alignment of plate edges during the welding process. All welded seams are X-rayed. Installation of the penstock pipes in the 520-ft-high Bureau of Reclamation dam was scheduled to start this fall.

All-Welded Locomotive Boiler

WORK on the first all-welded locomotive boilers to be made in Canada is now in progress at the Lachine works of Dominion Bridge Co., Ltd., Lachine, Que. Welding of these boilers is being done with the object of reducing the high cost and maintenance of conventional riveted types.

Two years ago the American Locomotive Company built two boilers of this type for Canadian Pacific Railways for test purposes. Results were satisfactory, and the C.P.R. decided to proceed with more boilers, placing an order for ten with the Dominion Bridge Co.

Dominion Bridge is supplying the smoke boxes, barrel courses and wrapper sheets, drilled or subdrilled for stays and attachments, while the C.P.R. shops are producing other components. Assembly being done at Lachine includes welding, X-raying and stress relieving; tubes will be installed after delivery. Production is being done in lots of five in order to take advantage of stack drilling and other quantity production methods.

* * *

Tailor-Made Beams

A STRUCTURAL member not available in rolled steel can be made from flat plate or rolled angles with the aid of the submerged-melt welding process. Other than the welding head, the only piece of equipment needed is a fixture to support the assembled beam.

The required beam components are flame-cut from flat plate, assembled with clamps and tack welded manually every 10 or 12 in. The tack-welded beam is then moved to the fixture for welding of the long seams by submerged-melt.

An I-beam like that pictured on page 55 can be fabricated in about an hour. This beam is 20 ft long, has flanges ⅜ in. thick and a web of ½-in. plate. After the first weld was made, the beam was

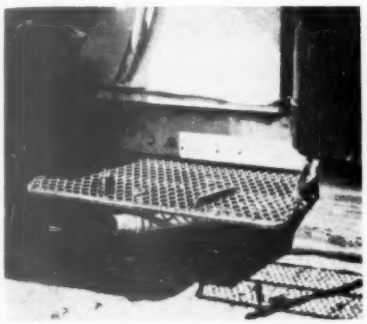
Courtesy The Linde Air Products Co.

SUBMERGED-MELT WELDING fabricates a heavy I-beam 20 ft long in about an hour

turned over and the second weld was made with the equipment in the same relative position. The beam was then turned end for end, and the third and fourth welds were made in the same manner. Welding speed was about 25 ipm.

Lower labor cost per foot of weld makes it possible to produce special shapes or even standard forms at costs comparing favorably with other types of fabrication. Some contractors are said to have found it to their advantage to stock only the sizes they use frequently and make up the other sizes as required in order to save investment and storage space.

* * *



EXTRA STEP with scrapers enables driver to keep his shoes clean in snowy weather

Safety Truck Step

By Elton Sterrett

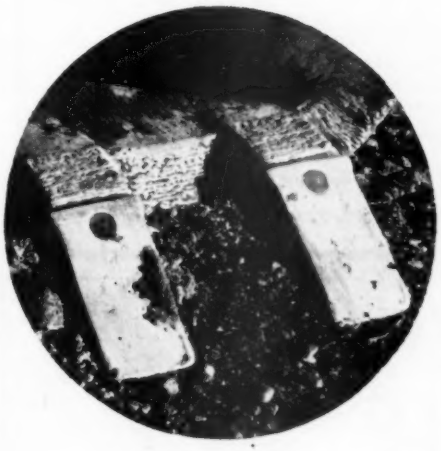
SNOW and mud clinging to a truck driver's footgear can result in a serious accident by causing his foot to slip from a pedal or by clogging the action of the pedals by collecting under them.

To avoid such accidents, the weldor of an oil-field servicing company built a secondary running board behind the regular step. It was formed of expanded metal and supported by a pipe frame. Snow or dirt falls through the open mesh so that a secure footing is afforded at all times.

Across the mesh, two scrapers of ¼-in. stock were welded at an angle to the edge of the step. These edges were handy for scraping shoes no matter how the driver would step onto his vehicle. If he uses the extra scraper-equipped step first and then moves over to the regular running board, the driver can be always assured of clean shoes and non-slipping contact with foot pedals.

FOR HARDFACING AND REPAIR

Amsco WELDING PRODUCTS



Amsco No. 459

Increases life 2 to 5 times for dippers, pug mill knives, brick dies, shredder knives, drag chain links, pulverizer hammers, sand pumps, and similar parts. Amsco No. 459 is centrifugally cast . . . resists softening up to 800°F. . . . and has a Brinell hardness of 500-600. No. 459 produces a chrome-moly martensitic iron deposit and is designed for severe abrasion service with moderate impact conditions.

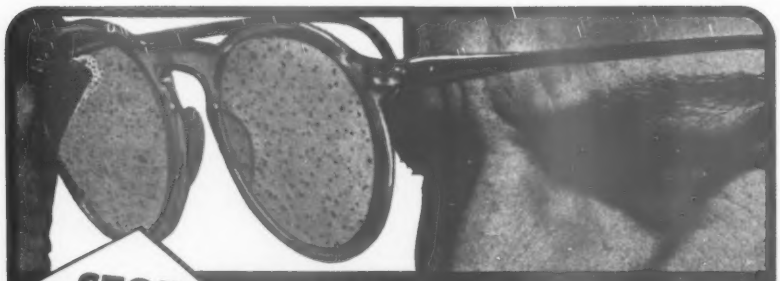
The application above shows Amsco No. 459 applied to the front and teeth of a manganese steel walking dragline bucket, used for stripping overburden from iron ore at a Minnesota mine. In similar applications where more severe impact coupled with abrasion is encountered, Amsco Economy Hardface is recommended.

Ask for free reprint of
Hard Surfacing by Fusion Welding

AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION
382 EAST 14th STREET • CHICAGO HEIGHTS, ILL.

Foundries at Chicago Heights, Ill., New Castle, Del., Denver, Colo., Oakland, Calif., Los Angeles, Calif., St. Louis, Mo. Offices in principal cities. Made and sold in Canada by Canadian Ramapo Division of Joliette Steel Ltd., Niagara Falls, Ont.



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TRADE MARK

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Save your lenses with TUF-COTE, the only true lens protection against weld spatter and grinding wheel pitting. Convince yourself, just send for a free sample TUF-COTE treated lens – give it the works in your own shop, and you will insist on having us treat all the glass safety lenses of your spectacles, goggles and helmets with TUF-COTE.

We grind and treat prescription lenses too. **TUF-COTE will leave them optically perfect, even clearer than before. For replacements order Wallace Eyeguard prescription glasses, TUF-COTE treated.**

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Just SEE What You Can Do

with the

VISE-GRIP

Welding Clamp

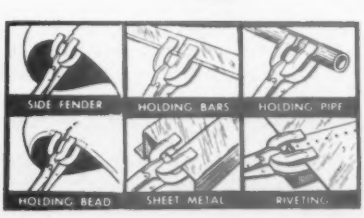
Locks

Parts in Alignment

FREES HANDS

for Welding

Simply (1) place the jaws over the parts to be welded—(2) close the toggle lever. This LOCKS the jaws to the work with powerful grip. The parts are held in alignment, securely—freeing both hands for handling the welding equipment. U-shaped jaws provide excellent visibility and working space for welding. Jaws adjust to 1-5/8". Made by makers of the famous VISE-GRIP Wrench. No. 9, 9", $2.95.

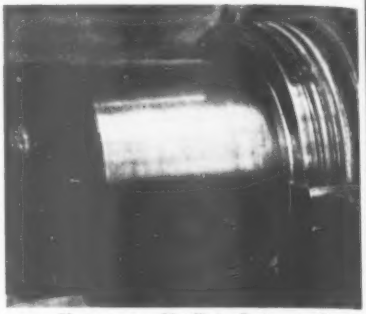


If not at your dealers, order direct.

PETERSEN MFG. CO.

Dept. WE-11, DeWitt, Nebr.

1—BEFORE metallizing, a badly damaged journal for a paper mill vacuum seal roll



Photos courtesy Metallizing Engineering Co., Inc.

2—AFTER metallizing and finishing, the same journal shown in Fig. 1 looks like this

Paper Mill Saves $18,840

PAPER mills, food, chemical and printing plants, rubber processors, roofing and flooring materials manufacturers, paper box makers, can manufacturers, steel mills and others are finding a gold mine in the repair of journals by metallizing.

As an example, a large Canadian paper mill uses nine 18-ton vacuum seal rolls, each 30 in. in diameter by 248 in. long. At both ends of these rolls are anti-friction bearing journals 10.829 in. in diameter by 23¼ in. long. To repair a worn journal (Fig. 1), the practice was to turn down the diameter and fit an undersize split sleeve in the bearing races. This method was never considered satisfactory: the sleeves were not interchangeable, and much wasted time and confusion resulted every time one had to be replaced. The repeated turning down of the diameters would have eventually meant scrapping the journals and replacing them at a cost of $1,115 each.

Now the worn journals are built up by metallizing (Fig. 2) at less than half the cost. One journal repaired by the old sleeving method cost $102 for material and labor. With metallizing, the total cost per journal is under $40, including preparation, spraying, finishing, labor and materials. Savings on a single repair job for 16 journals amounted to $1,003.30. Since diameters are not reduced by the metallizing method, the process can be continued indefinitely, thus saving the $17,840 that would eventually have been required for replacement under the old repair method. States the user: "The entire program when completed will effect savings of approximately $18,840."

ARCOS
LOW HYDROGEN
ELECTRODES

FOR WELDING HIGH STRENGTH LOW ALLOY STEELS

ARCOS pioneered the low hydrogen type of electrodes during the war years to produce sound welds when welding low alloy steels such as chrome-molybdenum, vanadium and nickel alloy steels.

ARCOS *quality-controlled* low hydrogen electrodes

- ★ Require no preheat on many jobs.
- ★ Have high impact values.
- ★ Give a complete range of tensile properties with high ductility.

	Yield Strength, psi	Tensile Strength, psi	Elongation in 2"	Reduction in Area
Manganend 1M	70- 85,000	90-100,000	20-30%	40-70%
Manganend 2M	85-105,000	100-125,000	10-20	15-20
Nickend 1	62- 69,000	70- 80,000	25-30	50-60
Nickend 2	65- 75,000	80- 90,000	20-30	45-60

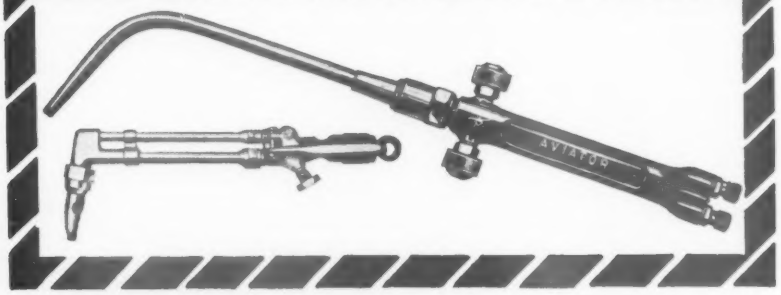
ARCOS Low Hydrogen Electrodes are recommended for welding:

- ★ Low alloy cast steels.
- ★ Low alloy high tensile strength rolled steels.
- ★ High carbon steels.
- ★ High carbon to mild steels.
- ★ Free machining steels.

Send for ARCOS Bulletin 1249 containing more specific information on the use of ARCOS LOW HYDROGEN ELECTRODES.

ELECTRODES • COILED WIRE • BARE ROD

the AVIATOR JET



a double-duty torch for your light welding and cutting

The "Jet" is as new and different as its name implies... designed for two operations from a single torch. It consists of two units, with the cutting attachment identical to that used with the famous WELDMASTER Torch, scaled down for lighter duty. For precision work with an eye on economy—*you'll want* the new MECO Aviator Jet.

We invite your inquiries.

Modern Engineering CO., Inc.

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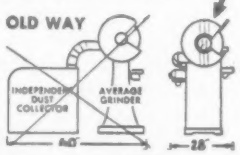
"BUILT-IN FEATURE"

SAVE OVER 50% FLOOR SPACE THE HAMMOND WAY



Hammond of KALAMAZOO

NO DUST GRINDER

- Requires only 6½ square feet.
- Protects employees' health.
- Protects nearby machine tools against excessive wear from dust and grit.

A self-contained Grinder and Dust Collector for 10", 12" and 14" wheels. Write for Bulletin No. 104.

Hammond Machinery Builders INC

1628 DOUGLAS AVE. • KALAMAZOO 54, MICHIGAN

30 YEARS AGO

(From THE WELDING ENGINEER of November, 1919)

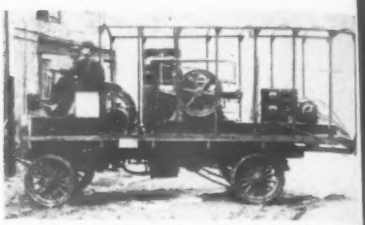


Photo Courtesy The Lincoln Electric Co.

TYPICAL PORTABLE engine-driven arc welding outfit. Including truck, the cost is about $4,000 and the equipment can be operated within a 75-mile radius of the shop

—30 YEARS AGO—

WELDED repair of scored automobile cylinders, damaged by loose wrist pins, has become a big business. L. Lawrence & Co. has opened plants in New York City, Buffalo, Chicago, Cleveland, Detroit, Los Angeles, Milwaukee, Minneapolis, Newark, Philadelphia, Pittsburgh and San Francisco. In addition, the patented Lawrence process, invented in 1915, has been licensed to 30 firms in this country, Canada and Australia. Process consists of fusing a silver-nickel alloy into the defects in the cylinder. A large business is done repairing cracked water jackets also.

—30 YEARS AGO—

MACHINE flame-cutting of 12 plates of ½ in. thickness is described in an article in this issue by Fred J. Mauerer, superintendent of the Chicago shops of the Davis-Bournonville Co. Much of the wartime production at shipyards and at steel mills could be traced to such time and labor-saving devices as this, Mr. Mauerer states.

—30 YEARS AGO—

THE Welders and Burners Association of Greater Boston has been formed with 300 members. M. W. Shea is president; Frank A. Donahoe, secretary-treasurer and L. Lewis vice-president. Another east coast organization of welders is the Brotherhood of Gas and Electric Welders and Operators of America at Newport News, Va. C. B. Crawford is secretary.

—30 YEARS AGO—

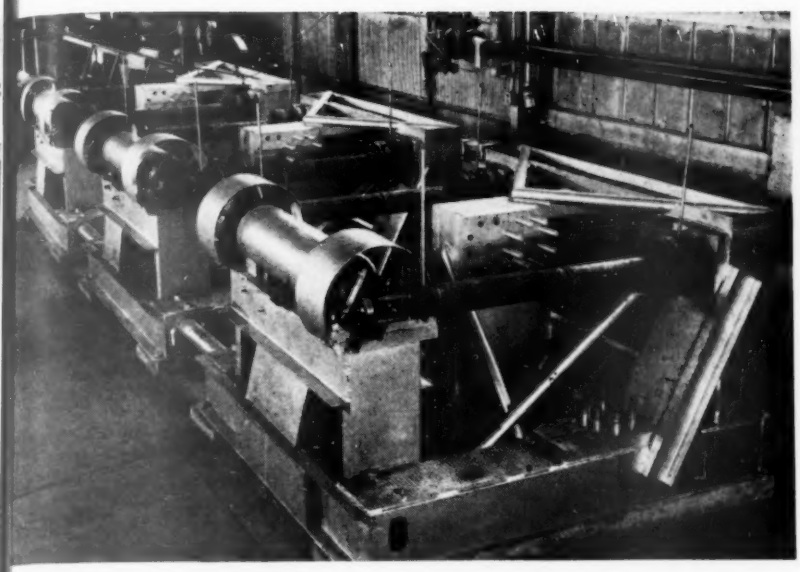
GREATER PROGRESS in England than in America in educating the public about welding is noted by the editor. Recently the British Acetylene and Welding Association was instrumental in having many uses of the oxyacetylene welding process in evidence at the Shipping, Engineering and Machinery Exhibition.

—30 YEARS AGO—

A CIRCULAR has been mailed by the Compressed Gas Manufacturers' Association urging all reputable manufacturers of compressed gas equipment to join the association. Dues are $10 per year.

—30 YEARS AGO—

TROUBLE with the welding of large circular lumber saws is reported by a reader from the North. Saw teeth crack about ¼ in. from the weld.



Strength through Design in Tube-Turn welding flanges

Taking the measure of piping fatigue

PIPE lines are *live, dynamic* members of a piping system. They *breathe* with changes in temperature and pressure. And the danger of fatigue failure from pressure shock, thermal shock, and cyclic conditions is ever-present.

More precise information was needed on this subject. So, Tube Turns research engineers set out to get the answers. For the purpose, they designed and built a unique cyclic testing machine to handle full-size piping assemblies under a wide range of temperature, pressure, and corrosive conditions. And on this torture rack they subjected flanged assemblies to reverse bending tests carried on to ultimate failure. Information revealed forms the basis of new designs for greater strength in Tube-Turn welding flanges.

Other piping assemblies, too—welding elbows, mitre bends, manufactured and fabricated tees, pipe bends—have been subjected to punishment more severe than any they would probably face in normal service.

And this perpetual search for greater strength through better design has paid off in the form of realistic, non-theoretical facts providing a sound basis for Tube Turns' manufacturing policies—facts important to anyone interested in getting his money's worth in long life from piping installations.

Tube Turns' research and development organization, finest in the welding fittings industry, is constantly striving for the improvement of present products, the development of new ones. Notable among their recent achievements have been the design of a new type welding tee and the development of aluminum welding flanges.

Ask to be put on the mailing list for Tube Turns' technical periodical, *Piping Engineering*. Paper 6.01, for instance, deals extensively with standard steel flanges. Others give you research findings and additional working information pertaining to piping not generally available in convenient form.

TUBE-TURN

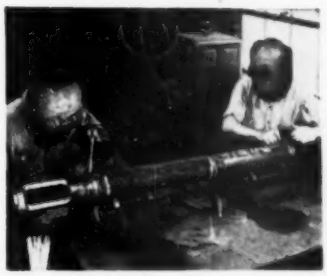
WELDING FITTINGS AND FLANGES

TUBE TURNS, INC.

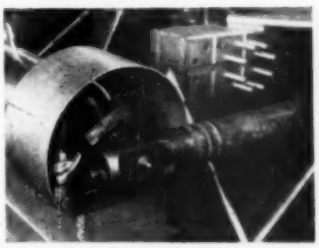
220 East Broadway, Dept. L, Louisville 1, Kentucky

District Offices at New York, Philadelphia, Pittsburgh, Chicago, Houston, Tulsa, San Francisco, Los Angeles

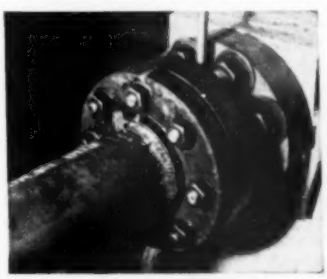
TYPICAL FLANGE ASSEMBLY TESTS



Assemblies were of 4-inch nominal size with 300 pound forged steel flanges and standard weight pipe.



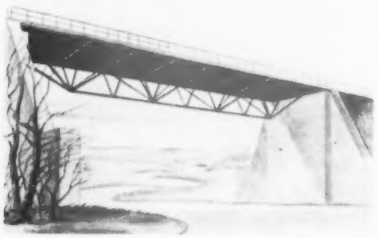
Eccentric crank arm produces up-and-down movement which creates a cyclic bending moment on flange or fitting at opposite end of assembly.



Water spurts from crack in test specimen. Almost invariably, failure occurred in the pipe adjacent to the flange.

Aluminum welding flanges . . . another Tube Turns first! Available in a wide range of types and sizes.

News of the Industry



AIRPLANE-LIKE triangular steel frame supports 120-ft bridge roadway in prize winning Lincoln Foundation welded bridge design

Lincoln Announces Awards In Welded Bridge Designs

AWARDS totaling $6,250 for the best designs of a two-lane, 120-ft deck highway bridge of all-welded construction were announced recently by the Lincoln Arc Welding Foundation.

The $3,000 first award went to Thomas C. Kavanagh, a professor of civil engineering at Pennsylvania State College, State College, Pa. In Mr. Kavanagh's design, a compact triangular shaped steel frame supports the bridge roadway. Using two new steel shapes, devised by Mr. Kavanagh, the airplane-like frame results in a simplified, lightweight, low-cost bridge of graceful and slender appearance.

Second award of $1,500 was received by Angel R. Lazara, Jr., Malabon, Rizal, Republic of the Philippines. His design featured a new Y-shaped member which serves the functions normally provided by several different members.

Fred C. Miller, a consulting engineer from Toledo, O., received third prize of $750. Mr. Miller's design employs a special shape which facilitates welding of steel pipe used for his bridge members.

Ten honorable mention awards of $100 each were made to the following: Kiser E. Dumbald, Columbus, O.; Carl W. Otto, Norfolk, Va., and Earle M. Cassidy, Phoenix, Ariz.; Lawrence W. Cox and Francis W. Cox, both of Omaha; R. W. Ullman, Cleveland Heights, O.; Paul Johan Tupker, Croningen, Holland; C. J. Pimenoff, Montreal, Canada; James H. Jennison, Pasadena, Calif; Hans H. Bleich, New York City, and John Russel Schwarting, Bellmore, N. Y.; Harold H. Gilbert, San Carlos, Calif.; Professor J. R. Daymond and M. S. Zakrzewski, Durban, South Africa.

The Rules Committee and Jury of Award for the contest consisted of: Wilbur M. Wilson, University of Illinois, Urbana, Ill.; Dr. E. E. Dreese, Ohio State University and chairman Board of Trustees, Lincoln Foundation; Harry C. Boardman, Chicago Bridge and Iron Co., Chicago; James G. Clark, University of Illinois, Urbana, Ill.; John I. Parcel, consulting engineer, Sverdrup and Parcel, St. Louis, Mo.; Lee E. Philbrook, Illinois State Division of Highways, Springfield, Ill., and Frank W. Stubbs, Jr., Purdue University, Lafayette, Ind.

* * *

A. O. Smith to Build Houston Welded Pipe Mill

THE second largest welded pipe mill in the country will be constructed by the A. O. Smith Corporation of Texas, which was recently formed by A. O. Smith Corp., Milwaukee. The line pipe will range in diameters down to 8⅝ in. and up to 30 in. and larger, if required, and will be fabricated in uniform lengths of 40 ft. Plant capacity will be 30,000 to 35,000 tons of pipe per month, second only to the Smith plant in Milwaukee.

The new plant will be located on Industrial Road in the Green Bayou area next to the present Houston works of A. O. Smith. It is also adjacent to the plant of Sheffield Steel Corp., a subsidiary of Armco Steel Corp., which will provide most of the steel. Capital stock of the new company is held equally by A. O. Smith and Sheffield.

Construction of the plant will cost in excess of $5,000,000 by the time it is in operation next summer. Tremendous savings in the cost of transporting steel and pipe to the southwest will be realized with the new plant, say company officials.

The A. O. Smith method of fabricating pipe includes forming flat plate (skelp) into a cylindrical shape by a series of U-forming, crimping and closing presses and flash welding the edges to complete the circumference.

* * *

Newark Distributor Named Airco Dealer

ESSEX WELDING EQUIPMENT CO., INC., 17-19 Tichenor Lane, Newark, N. J., has taken over the W & E Supply Co., and the consolidated company has been appointed an Airco distributor for Newark and surrounding areas.

President of the Essex company is A. C. Axtell. The firm has been in business for more than 20 years and is one of the largest welding distributors in New Jersey.

* * *

Large Detroit Quarters for Bay State Abrasive

THE Detroit branch office and warehouse of Bay State Abrasive Products Co., Westboro, Mass., is now located at 880 Lawndale Ave., Detroit 9. The new quarters offers increased stocks plus a modernized grinding wheel alteration service for customers in the Michigan area.

63 Delegates Attend New York NWSA Meeting

GOOD attendance marked the September 29 meeting of the National Welding Supply Association in New York City at the Hotel New Yorker. 63 delegates were present to hear R. S. McCracken, Jr., of R. S. McCracken & Sons, Inc., Philadelphia, conduct the meeting. Mr. McCracken is vice-president of the association for the eastern zone.

First discussion of the day concerned the importance of the manufacturers' sales policy to the distributor and was led by W. R. Boyd, Boyd Welding Co., Erie, Pa. R. P. Mahony spoke on the steps manufacturers can take to assist the distributor in his sales effort.

Joseph A. Cunningham of J. A. Cunningham Equipment, Inc., Philadelphia, opened a discussion on the subject: Can distributors be expected to carry and aggressively sell lines which do not provide an adequate gross margin? Mr. Cunningham emphasized the importance of individual distributors expressing their views to manufacturers by letter when changes are made in resale schedules that are not favorable to them.

Joe Beckett, Allentown, Pa., talked on the topic, "What We Are Doing to Keep Our Accounts Receivable Within Reasonable Limits." Mr. Beckett stressed the value of the NWSA collection bureau and credit stickers. James Norcross, sales manager of Arcos Corp., Philadelphia, gave a valuable discussion about how his firm selects distributors.

Three distributors have applied for membership in the association. They are: Garden State Welding Supply Co., 673-75 Montgomery St., Jersey City 6, N. J.; McKinney Welding Supply Co., 535 West 52nd St., New York City 19; Herr Welding Supply, 1928 Greenwood St., Harrisburg, Pa.

* * *

Victor Equipment Acquires Hard-facing Manufacturer

MILLS ALLOYS, Inc., Los Angeles, maker of hard-facing alloys and blasting nozzles, has been purchased by Victor Equipment Co., San Francisco, for 5,100 shares of Victor capital stock.

The Mills plant will be Victor's hard-facing division, according to L. W. Stettner, Victor president. Rod rolling and mill equipment will be added to present facilities to produce a complete line of hard-surfacing alloys.

The new rods to be manufactured will replace some products now distributed by Victor. Dealers for the new lines will be established to augment sales outlets.

* * *

Air Tool Manufacturer Bought by Bingham-Herbrand Corp.

ASSETS of Superior Manufacturing, 1302 Ontario St., Cleveland 13, have been acquired by the Bingham-Herbrand Corp., of Toledo and Fremont, O. The acquired firm will operate in the future as a part of the Herbrand Division. It makes air hammers, blow guns, air filters, air line oilers and air-line couplers.

J. E. Terry, associated with Superior since its founding in 1932, will carry on as general manager.

Improve the Profit Factor on your Poor-Fit work with P&H "PF" 6012 electrodes

These "PF" Advantages Make Your Welding Operation More Profitable

- High deposition rate — for lower costs
- Quiet with less spatter — for better efficiency
- Good general-purpose, all-position rod — also excellent for sheet metal
- Operates on AC or DC — versatile

"PF", as the symbol indicates, is designed especially for poor-fit-up jobs. It solidifies quickly. That's what makes "PF" ideal for the toughest irregular and poor-fit problems.

For fast, quiet action that speaks savings louder than words, insist on "PF" electrodes. Call your P&H representative or distributor for a demonstration. You'll quickly see how "PF" improves your profit factor. Write for procedure sheet R-14.

P&H

WELDING ELECTRODES
4513 W. National Avenue
Milwaukee 14, Wisconsin

HARNISCHFEGER CORPORATION

EXCAVATORS • OVERHEAD CRANES • HOISTS • ARC WELDERS and ELECTRODES • SOIL STABILIZER • CRAWLER and TRUCK CRANES • DIESEL ENGINES • CANE LOADERS • PRE-ASSEMBLED HOMES

THIS IS LOW COST WELDING!

When a touch on a button moves weldments like these into the correct, most convenient position for a downhand pass, you get more arc time, more welding at lower cost. C-F power operated Positioners rotate the work in a full circle at any point in a range of 135° from the horizontal — giving welders a choice of an infinite number of downhand welding positions instantly.

Every requirement for faster, better positioned welding — constant or variable speed table rotation, full 135° tilt, self-locking gearing which holds the table in any position, oversize built-in main tilt and rotating bearings, choice of two base styles, and many other features — are built into C-F Positioners.

C-F Positioners are available in Hand or Power operated models, and are made in capacities up to 30,000 lbs. and larger.

Write for the new C-F Positioner Catalog

CULLEN-FRIESTEDT CO.

1309 S. Kilbourn Avenue Chicago 23, Illinois

CULLEN-FRIESTEDT CO., CHICAGO 23, ILL.

C-F positioned welds mean better, more economical welds

SAVE! TIME AND MONEY

SPEEDY LAYOUT JOBS ON PIPE AND STRUCTURAL STEEL

NOW! NEW EASE AND SPEED WITH THE CONTOUR MARKER

Compact, fits into hip pocket. Efficient, accurate, easy to use. Any of the angles in the illustration to the right can be marked off in five minutes or less on any pipe from 1½ to 18 inches. Saves time, labor and gas—will pay for itself in one day.

IF YOUR LOCAL DISTRIBUTOR CANNOT SUPPLY YOU CAN ORDER DIRECT.

TO: CONTOUR MARKER CORP.
1843 E. Compton Blvd.
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Please send me full details on the Contour Marker.

NAME .....

COMPANY .....

STREET .....

CITY .....

John Nooter Company Becomes Nooter Corp.

NOOTER Corporation is the new name of the John Nooter Boiler Works Co., St. Louis. No change in personnel, policy or address is involved in the renaming.

The firm was founded in 1896 as a job shop for manufacturing boilers and similar equipment. Since then Nooter products have been diversified and the business has become world wide, especially in the chemical, petroleum and processing industries.

Changing of the firm name was felt to be in line with its present-day role as one of the country's largest fabricators of tanks and vessels of steel and other alloys.

* * *

Welding Firm Opens Montana Branch Office

ENGINEERING DEVELOPMENT CORP., Bremerton, Wash., has announced plans to open a branch at Great Falls, Mont., to cost approximately $100,000. The firm specializes in the welding of cast iron. Its new plant will handle automobile cylinder heads and blocks as well as other welding jobs in the states of Montana, Idaho, Utah and Nevada. The present Bremerton plant now serves Washington, Oregon, California and Canada.

* * *

Wollastonite May Serve for Welding Fluxes

PROSPECTIVE uses for wollastonite, a new industrial mineral mined in New York state, include welding flux, abrasive-wheel products, pottery glaze, paints, paper and rubber, according to a 100-page report (PB97826) recently issued by the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. The report, available at $2.50, states that samples will be available for industrial investigations by interested firms.

* * *

New Headquarters Named by New England Distributor

INTERSTATE WELDING SUPPLY CORP. has established new headquarters at 216 Broadway, Cambridge, Mass., as the base of its operations in New England. All six states in this area are served by the company.

George R. Cushman, president and general manager, was connected with the Austin-Doten Co., and its successor, the Austin-Hastings Co. of Cambridge, for a total of 27 years.

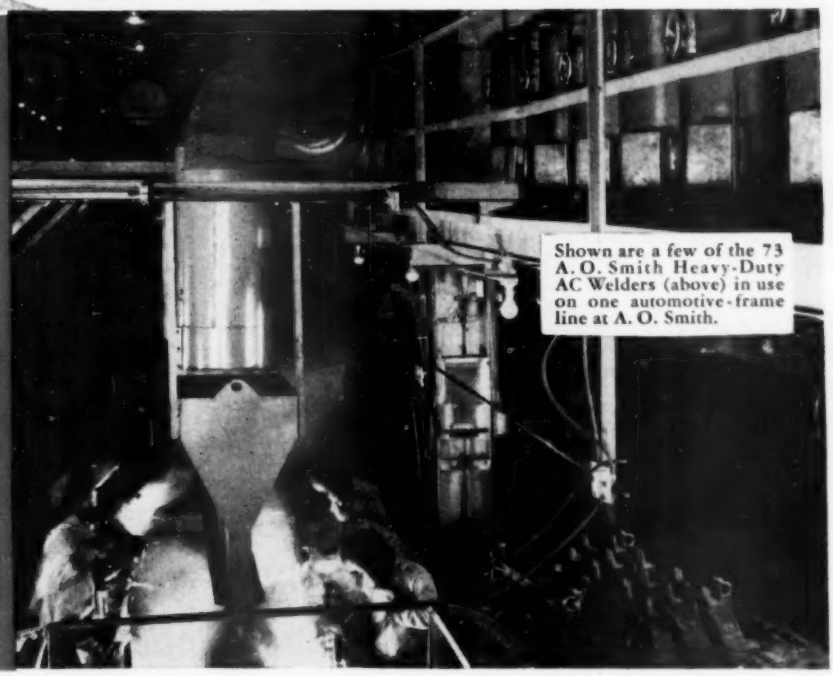
* * *

All-State Remodels Electrode Packages

METAL-CAPPED tubes have replaced the fibreboard boxes previously used to package welding rods and electrodes manufactured by the All State Welding Alloys Co., Inc., White Plains, N. Y. The new tubes are said to withstand rough handling and also provide a storage place in a tool box or supply kit. Instructions for use of the contents are printed on the outside of each box. Packages provide standard amounts as small as 5 lb.

Fewer Shutdowns—Less Maintenance —and Power Costs Cut up to 1/3!

A.O.Smith HEAVY-DUTY AC PRODUCTION WELDERS



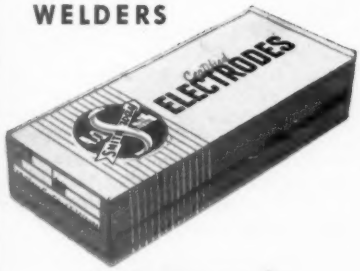
Shown are a few of the 73 A. O. Smith Heavy-Duty AC Welders (above) in use on one automotive-frame line at A. O. Smith.

Designed and built to meet the exacting demands of A. O. Smith's own production welding, A. O. Smith AC Welders embody shop-proved features that assure faster welding and cut welding costs.

The exclusive weatherproof case—rain-proof, dripproof, and splash-proof—is standard in Heavy-Duty models at no extra cost. Continuous stepless current control, from a single hand wheel, will not creep. Full 75 open-circuit volts eliminates starting boosters and similar devices, gives faster starting and easier welding. High-velocity *down-draft* ventilation keeps air dust from settling on coils, keeps floor dirt on the floor.

SAVE UP TO 39% ON POWER. Wherever A. O. Smith AC Welders have replaced DC motor-generator installations, power savings go as high as 39%. Our engineers can compute these savings in your plant, *in advance*. Send the coupon for details of the Welder Power Savings Plan.

MADE BY WELDERS . . . FOR WELDERS



A.O.Smith *Certified* ELECTRODES

Proved in production in A. O. Smith's own plants—where modern heavy-coated electrodes were originated. Sizes and types for every welding requirement, any welding position, any size job. Send the coupon for our *free* Electrode Catalog.

Electrodes and Accessories Sold by Distributors Everywhere

A.O. Smith Good Smith Way 75th ANNIVERSARY 1874 · 1949

A.O.Smith

AC WELDING MACHINES

New York 17 • Philadelphia 3 • Pittsburgh 19 • Atlanta 3 • Chicago 4 • Tulsa 3 Midland 5, Texas • Dallas 1 • Houston 2 • Seattle 1 • San Francisco 4 • Los Angeles 14 International Division: Milwaukee 1

A. O. SMITH CORPORATION, Dept. WE-1149, Milwaukee 1, Wisconsin
Without obligation, send us complete information on:

- ☐ A. O. Smith Heavy-Duty AC Welders
- ☐ A. O. Smith General-Purpose AC Welders
- ☐ A. O. Smith Welder Power Saving Plan
- ☐ A. O. Smith *Certified* Electrode Catalog

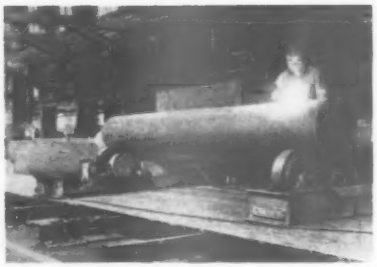
Name _____ Firm _____

Street _____ City _____ State _____

Less Handling—More Welding

It's handling that costs most in welding . . . the crane work or manual labor in positioning the pieces—plus the welder's *waiting* time.

Get more arc-time from every hour by using Worthington-Ransome Turning Rolls to handle tanks, drums or any type of cylindrical vessel regardless of size. They continually bring the work into position for efficient, economical *downhand* welding (manual or automatic) with heavier electrodes which means fewer passes and better welds.



50% greater production on both repetitive and job work has been reported by users.

Capacities from 3 to 75 tons, up to 14 ft. diam., stationary or self-propelled. (Rolls for heavier or larger work also available.)

WORTHINGTON

WORTHINGTON PUMP AND MACHINERY CORPORATION

Welding and Assembly Positioning Equipment Division

DUNELLEN, NEW JERSEY

YB.7

Worthington Pump and Machinery Corp.
Dunellen, N. J.

Please send Bulletin 228 on Worthington-Ransome Turning Rolls.

NAME.....

COMPANY.....

ADDRESS.....

Lincoln Foundation to Award 77 Prizes to Undergraduates

THIRD annual competition of the Engineering Undergraduate Award and Scholarship Program, announced in October by the James F. Lincoln Arc Welding Foundation will bestow awards and scholarships worth $6,750 to engineering undergraduates and to schools for the best papers prepared by the students on arc welding design, research, fabrication and maintenance.

A total of 77 awards ranging from $1,000 to $25 will be awarded to students and $1,750 for seven scholarships will be awarded to schools. Schools in which the three top awards are made to students will receive scholarships equal to those awards. Each scholarship is worth $250, four being given to the school of the $1,000 winner, two to the school having the $500 winner and one to the school having the $250 winner.

All resident engineering undergraduate students, including agricultural and architectural, registered in a school or college in the United States are eligible to compete. A copy of the rules may be obtained by writing James F. Lincoln Arc Welding Foundation, Cleveland 1, O.

* * *

Oxygen, Welding Equipment To Be Bought by Italy

BUYING missions from four Italian industries were in the United States in October to purchase $7,332,000 worth of American welding, rolling, refining and oxygen equipment.

Ferrotubi of Brescia, Italy, was to buy a $200,000 welded-pipe producing plant. Sisma of Milan will purchase a rolling mill for plating and other iron and steel producing machinery worth more than $2,200,000.

The Societa Nazionale "Cogne" of Turin has been authorized by the Institute Mobiliare Italiano to seek bids on a billet rolling mill and an oxygen producing plant, the latter to cost up to $191,000.

The Aquila Oil Refinery at Trieste will purchase oil refining equipment up to $3,859,000 worth including a unit for processing 3,000 barrels a day of high-octane benzine.

—*McGraw-Hill World News*

* * *

August R-W Sales 81% Over July

SALES during August of resistance welding equipment were 81% ahead of July, the Resistance Welding Institute reports. Actual shipments rose 70% during the same period, with cancellations dropping more than 12%. The shipment of electrodes increased 20%.

The unpredicted increase in the sale of resistance welders brought to an end a steady decline which began earlier in the year. The resumption of large scale purchases of resistance welders by the automotive, refrigeration, stove, television and appliance industries is taken to mean a more aggressive development of the competitive consumer market, since these industries have always been the largest users of such equipment.

Grey Iron Foundry Planned by Budd

THE BUDD Company will erect a modern foundry for the production of grey iron castings in northeast Philadelphia. To cost $1,500,000, the plant will furnish castings for other divisions of Budd to better serve the company's automotive customers with eastern assembly plants.

The brick structure will measure 120 by 360 ft and be one story high. Between 400 and 500 workers will be employed there at top production. The first unit in the foundry is expected to be in operation in the spring of 1950.

* * *

Large-Diameter Piping Submerged-Melt Welded

HYDRAULIC-PRESS forming and submerged-melt welding are combined to make steel piping in wall thicknesses of from ¼ to ½ in. or heavier and in sizes from 8⅝ to 30 in. or larger OD in a process developed by the Yoder Co., Cleveland. The complete mill, as engineered and built by Yoder, includes a plate flattener, edge trimmer, scrap chopper, edge scarfer and shot blast unit, hydraulic presses, automatic welders, entrance conveyor and welding mandrel.

By the combination of press forming with automatic arc welding, each 40-ft length of pipe is perfectly formed and welded longitudinally from end to end.

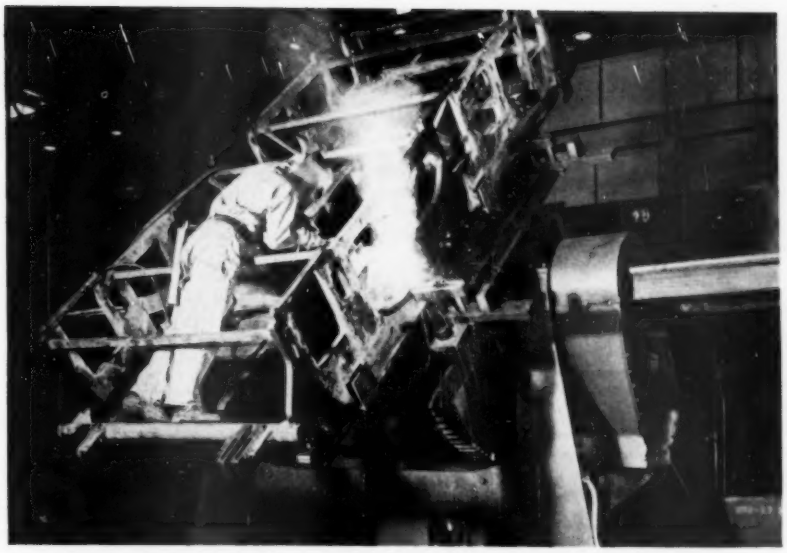
Peak production of the mill for single-shift operation is estimated at 75,000 tons per year or 2,300,000 ft. Profitable operation might be maintained on as low an annual production as 10,000 to 15,000 tons of welded piping, Yoder estimates.

* * *

Boat Welding Shop Enlarges Facilities

CONSTRUCTION of a new plant has begun at the Lake Craft Welding Shops, Port Clinton, O. Welding equipment will be installed for building steel boats used for commercial fishing and pleasure cruises. Sam Conti is the operator of the concern.

"She's a good worker, but she goes out for coffee too often!"



More Arc-Time Per Hour

You pay your welders for welding . . . so the time it takes them to *position* the work—or themselves—is *lost* welding time.

But a Worthington-Ransome Positioner quickly tilts and rotates the work for practically *continuous* welding—always in the efficient *downhand* position that permits using heavier electrodes for *quicker, neater, better* welds.

Mass production or job welding . . . small pieces or "crane" work . . . automatic or manual welding—Worthington-Ransome Positioners quickly *pay* for themselves with increased production, lowered labor costs—up to 50%.

Capacities from 100 lb. to 20 tons.

WORTHINGTON

WORTHINGTON PUMP AND MACHINERY CORPORATION

Welding and Assembly Positioning Equipment Division

DUNELLEN, NEW JERSEY

YB 6

50% PRODUCTION UP

Welding Positioners Turning Rolls

LABOR COSTS DOWN

Worthington Pump and Machinery Corp.
Dunellen, N. J.

Please send Bulletin 210C on Worthington-Ransome Welding Positioners.

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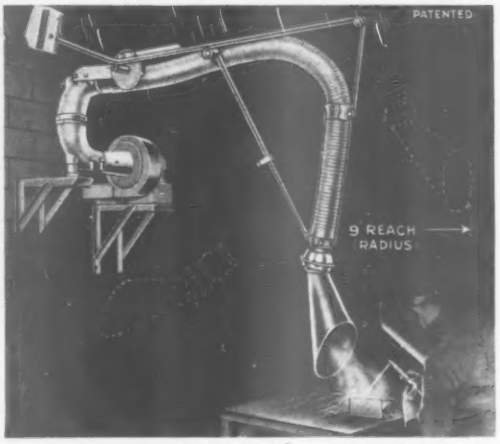
COMPANY .....

ADDRESS .....

RUEMELIN Fume Collector



(Above) Welding without ventilating snout. Note smoke clouds and poor vision. Gases and heat surround operator's helmet.

(Right) Collecting fumes with a Ruemelin Fume Collector.

REMOVES WELDING FUMES *at the Source!*

Solve your welding fume problem efficiently by installing Ruemelin Welding Fume Collectors. They produce a powerful suction that removes smoke, gas and heat at the source. Guards employee health, resulting in less welder fatigue. Clears shop air with minimum heat loss. Covers maximum welding area vertically, horizontally and by circle swing. Made in 9 ft. and 15 ft. reach sizes. Shipped assembled, easy to install. Thousands in practical service. Free engineering service for your installation.

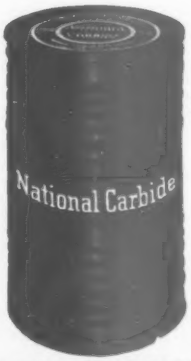
Write for our New Bulletin 37-D and list of users — just off the press.

RUEMELIN MFG. CO.

MANUFACTURERS AND ENGINEERS
SAND BLAST AND DUST COLLECTING EQUIPMENT
3880 NORTH PALMER STREET • MILWAUKEE 12, WISCONSIN, U. S. A.

National
Carbide

EFFICIENT
ECONOMICAL
DEPENDABLE
for
Welding & Cutting
SPECIFY



NATIONAL CARBIDE IN THE RED DRUM

Write us for information as to nearest available stock.

NATIONAL CARBIDE CORPORATION

60 E. 42nd St., New York 17, N. Y.

TWO-HANDED SWORD blade from crusader times analyzed by a Geiger counter and X-rays

Geiger Counter Used To Analyze Steel

RECENT tests at the United States Steel Corp. laboratory at Kearny, N. J., have indicated possibilities of using Geiger counters for analyzing steel specimens. The more familiar use of Geiger counters is connected with atomic radiation and radioactive elements, but this use has nothing to do with steel analysis.

In this instance, Geiger counters with special spectrographic equipment are used to measure invisible fluorescent rays that emanate from a steel sample when its atoms are ionized by high intensity X-rays.

Should this test prove accurate and quick under all conditions it will save time and much preparation ordinarily required by the chemical or spectrographic methods.

Source of X-rays for the U. S. Steel tests was a 20-milliampere, 50-kilovolt, molybdenum targe tube. The ray floods the steel specimen exciting secondary rays which are characteristic of the chemical elements alloyed with iron in the sample. These fluorescent rays are reflected through a narrow slit, at right angles to the path of the primary X-ray, to a crystal monchromator. This crystal is in the center of a circle, one-fourth of whose circumference is traversed by the Geiger counter in its round of analysis. The counter is moved by a motor in the scanning operation. In turn the counter is connected to a standard recording instrument, which automatically plots the intensities of the various elements on graph paper.

Work previously had been handicapped by the necessity of measuring ray intensities with photographic film.

This method of analysis is best adapted to detect and measure elements of "middle" atomic weight. Among these are the elements most often combined with iron and carbon to form the various steels in common use — chromium, manganese, molybdenum and nickel, as well as copper, which is frequently added to a steel composition to lessen corrosion.

Better Quality Welding Rods—

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

TO HELP YOU obtain uniform coatings and standardize your mixing and drying operations, Du Pont Silicates are supplied with *controlled chemical and physical properties.*

WIDE RANGE OF GRADES

1. **Solutions of** Sodium Silicate and Potassium Silicate are available as binders in a wide variety of grades for DC or AC rods of desired use characteristics.
2. **For coatings of high-arc** conductivity, No. 865 Grade* Potassium Silicate Solution has binding properties specifically "tailored" to meet the requirements of AC-rod manufacture.
3. **For coatings requiring anhydrous,** prefused powders, both Sodium Silicate and Potassium Silicate, are available in powdered grades.

EASIER MIXING AND COATING are assured through special solution modifications designed to give improved wetting of particles by the binder.

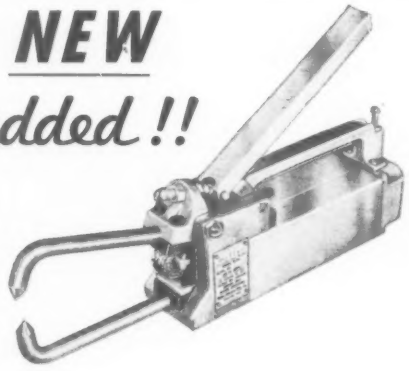
DU PONT TECHNICAL SERVICE is available to all welding rod manufacturers—without cost or obligation—to help you select the most effective grade of Sodium Silicate for your particular requirements. For full details, write the Du Pont Company, Grasselli Chemicals Dept., Wilmington 98, Delaware.

*Patented, U. S. No. 2,344,621, for use in welding rod manufacture.

For BETTER welding rods:

DU PONT SODIUM and POTASSIUM SILICATES

Something NEW has been added!!



A NEW TYPE TOGGLE ACTION TONG LEVER THAT MULTIPLIES THE PRESSURE EXERTED ON THE WORK HAS BEEN ADDED TO THE MILLER PORTABLE SPOT WELDER!

With ordinary lever type spot welders where material fitup is poor, sufficient hand pressure cannot be exerted to pull the material together. The toggle action lever eliminates this difficulty. The lever may be adjusted to either close tight on the work or to pivot past center and lock tight on the work. Thereby, the operator can close the welder on the material to be "spotted"—forcing it up tight and locking it together—and then, operate the switch with either hand. The design assures uniform pressure on every spot and results in higher quality welds. An adjustment is provided between the lever and the tongs to compensate the various thicknesses of metal. At the rear of the handle another adjustment regulates the distance the handle closes.

There is no need to bring the work to this spot welder—take the welder to the work—easily and quickly.

Tongs and tips of special size and shape will be built on request.

ARC miller WELDERS

miller ELECTRIC MANUFACTURING CO.

APPLETON, WISCONSIN

LIGHT, EASY TO WEAR *Protection* AGAINST HARMFUL WELDING FUMES

M·S·A

Gas-Fume

RESPIRATOR

Designed for maximum wearing convenience and comfort, the new M.S.A. Gas-Fume Respirator serves the welder with dependable respiratory protection on the job. Featuring the compact, snug-fitting Comfo Cushion facepiece and twin, independently replaceable mechanical and chemical filters mounted on the wearer's back (out of the way of heavy welding fumes), this lightweight respirator can be worn with complete ease under various types of welding helmets or with welder's goggles. Write for details in Bulletin CR-23.

MINE SAFETY APPLIANCES CO.

MINE SAFETY APPLIANCES COMPANY

BRADDOCK, THOMAS and MEADE STREETS · PITTSBURGH 8, PA.

At Your Service: 54 BRANCH OFFICES IN THE UNITED STATES AND CANADA

Victor Equipment to Make Corrosion-Resistant Regulators

HIGHLY corrosive gases such as wet chlorine, wet sulphur dioxide, wet hydrogen sulphide, wet ammonia and wet boron trifluoride can now be handled through a new type of corrosion-resistant regulator being manufactured by the Victor Equipment Co., San Francisco. The required corrosion resistance can be developed into any of the company's assortment of standard regulators. Delivery pressures up to 5,000 psi, gas volumes up to 2,000 cfm, remote control, precision regulators and compactness are claimed to be features of the new models.

• • •

Indiana Weld Shop Owner Flies Steel for Rush Job

"RUSH!" on an experimental mold order for the auto industry recently dictated a flying trip for specially cut steel on the part of a welding shop owner. Joseph Leaman, of Leaman Welding and Machine Corp., Lafayette, Ind., phoned for the steel to Joseph T. Ryerson & Son, Inc., Chicago steel warehouse firm, at 10:55 one morning.

After cutting the steel, Ryerson rushed it by truck to Northerly Island airport on Chicago's lake front to meet Mr. Leaman's airplane at 1:00 p.m. Taking off as soon as the steel was loaded into the airplane, Mr. Leaman flew back to Lafayette where he was able to make the production deadline.

• • •

Apply High-Frequency to Weld Boiler Tubes

PRINCIPLES of induction heating and pressure welding are combined in a new welding process developed for boiler tubes at the Chattanooga plant of Combustion Engineering-Superheater, Inc. A high-frequency generator and induction coil are used to heat the ends of the piping to a plastic state, after which the pipe sections are forced together to make a pressure-type weld. An enclosed atmosphere surrounds the pipe ends to protect the welding surfaces against oxidation during the heating period.

This method is expected to be less expensive and more uniform than hand welding, and the use of backing rings is avoided. Both straight and bent tubing may be welded. Tubes, drum hangar rods and headers, in diameters ranging from 1 to 10 in., may also be welded.

• • •

Lincoln Electric Returns To 40-Hour Work Week

OPERATIONS at Lincoln Electric Co., Cleveland, have returned to a full 40-hour week after several months of 4-day week operation. The number of orders for welding equipment has turned upward, a trend which started in August.

Work on the new Lincoln plant is progressing rapidly and the contractor hopes to have half of the building under a roof by the end of November so that inside work can be carried on during the winter. Plans for occupancy of the plant call for the move to be finished in the fall of 1950.

The REID-AVERY CO. Inc.

DUNDALK · BALTIMORE 22 · MARYLAND

SINCE 1919

Producers of Arc Welding Electrodes and Welding Rods

The Largest and Most Modern Plant in the U. S. A. devoted exclusively to Wire Drawing and the Manufacture of All Types of Welding Rods and Arc Welding Electrodes.

ALL OF OUR PRODUCTS ARE MARKETED THROUGH AGENTS AND DISTRIBUTORS, WHO IN MANY CASES USE THEIR OWN TRADE MARKS AND DESIGNATIONS.

Wire in catchweight coils of all standard welding grades. Furnished in Plain mill finish, Sull finish, and copper coated.

Straightened and cut lengths 14"-18"-36" standard.

Furnished in special rewound coils of all standard weights and dimensions.

Special layer wound coils for submerged arc welding.

Type D and Type M for automatic open arc welding in catchweight and special rewound coils. Type D is furnished in straightened and cut lengths for extremely high speed manual welding.

Raco composite Type A in special rewound coils. A fully shielded open arc automatic electrode. Furnished in mild steel, hard surfacing (3 grades), high tensile low alloy, and stainless steel grades.

We manufacture a full line of shielded arc electrodes of the highest quality offered to industry. Carbon steel grades, hard surfacing (3 grades), high tensile low alloy grades, ferritic, and many grades for special purposes.

We draw all of our own stainless steel wire, and manufacture a full line of stainless steel shielded arc electrodes. We furnish stainless steel welding rods in straightened and cut lengths for gas welding, also many grades of stainless steel welding wire in special rewound coils for submerged arc welding.

We manufacture Racolloy Nickel electrodes AC-DC for machinable welds on cast iron.

Raco Type M-9 Knurled wire for high quality, high production, automatic open arc welding.

Members of THE AMERICAN WELDING SOCIETY
THE NATIONAL WELDING SUPPLY ASSOCIATION

The

KENT

SUCTION CLEANER

for

FLUX RECOVERY

Pays for itself by salvaging valuable flux!

This compact, easily portable machine can be adapted to any type of welding application.

The KENT SUCTION CLEANER

The Kent Suction for Flux Recovery picks up the unfused flux and small fused particles from the weld. The fused particles are automatically screened out of the flux and the fine dust is removed—clean flux is then deposited in the lower tank ready to be returned to the automatic welder as needed.

For literature and prices write to:

THE KENT COMPANY, INC.

436 Canal St. • Rome, New York

Representatives in Principal Cities

U. S. Testing Co. to Qualify Weldors

To QUALIFY weldors who work for welding contractors and steel fabricators, The United States Testing Company, Inc., has set up test facilities at a plant at Hoboken, N. J. The employer merely sends prospective weldors to the testing company plant, where qualification tests are made and the weldments tested in a continuous operation of from 24 to 48 hours. Certificates are then issued to cover the qualified men.

Furber Smith, who heads the engineering inspection division of the company, states that the service was developed to meet an urgent customer demand for simplified weldor qualification.

* * *

Western Steel Firm Builds Houston Piping Mill

CONSOLIDATED Western Steel Corp., Los Angeles, a subsidiary of U. S. Steel, is building a welded steel piping mill at Houston, Tex. Preliminary construction work has already begun on the property which is near the Houston ship channel.

Annual capacity is estimated to be 100,000 net tons of 24-in. and larger diameter pipe. Monthly production will be approximately 50 miles of pipe.

At the present time U. S. Steel has no facilities for production of this type of pipe east of the Rockies or south of the Pittsburgh, Pa., area.

* * *

Quality Control Meeting At St. Louis, Nov. 10-11

FOURTH Midwest Quality Control Conference will be held at St. Louis at the Jefferson Hotel on Thursday and Friday, Nov. 10 and 11.

Designed to acquaint representatives of industry with some of the methods of quality control, the conference offers clinical and training sessions plus a lunch meeting.

* * *

Reynolds Now Stud Welds Aluminum Roofing and Siding

REYNOLDS Metals Company has adopted the stud-welding method for attaching of 0.032-in. corrugated aluminum roofing and siding to structural-steel framing members.

To apply the aluminum sheet, a composite stud is welded to the structural steel framing member (purlin or girt), using a hand gun fitted with automatic controls. Then the aluminum sheet is placed over the studs and impaled on them by blows from a rubber mallet. Aluminum washers are placed over the projecting tips of the studs and the tips are headed to secure the sheet. The entire operation is handled from outside the building.

* * *

California Distributor Moves from Los Angeles

RALPH LEMASTER CO., distributor of compressed gases, welding and cutting equipment and other welding accessories, has moved to a new address at 2424 East Slauson Ave., Huntington Park, Calif. The company was formerly located at 7720 Santa Fe Ave., Los Angeles.

WHAT EVERY WELDER NEEDS

"Everything to weld anything"

ALLOYS AND FLUXES FOR DOZENS OF GAS WELDING AND BRAZING JOBS.

All especially made for Low-temperature

- Save dismantling
- Save reassembly
- Save time
- Save gases

ECONOMICAL, PRACTICAL, HANDY

That's the

DOC ALLOYS KIT

THIS NEW COMPLETE KIT MEETS ALL MY GAS WELDING NEEDS!
DOC ALLOYS KIT
All-State
price complete $15
ALL-PURPOSE . . . LOW COST . . . SAVES TIME . . . EASY TO USE

All-State Doc Alloys Kit provides a generous plenty of alloys and fluxes for a wide range of maintenance jobs. Enough to last a long time — and replaceable from bulk purchases.

It contains ample silver solder, and ten other kinds of alloys for low-temperature work, in a leatherette roll. And it contains galvanizing powder, and the wide selection of 8 fluxes to assure the very best low-temperature welding and brazing work.

YOUR ALL-STATE DISTRIBUTOR designed this kit right down to the handy, sturdy metal box in which you carry it. He carries a stock of them. He suggests every maintenance outfit should include one. Phone, write or wire him. Ask for

ALL-STATE

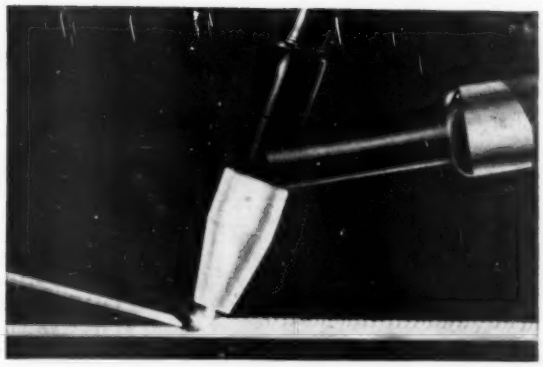
DOC ALLOYS KIT

All-State Welding Alloys Company, Inc.

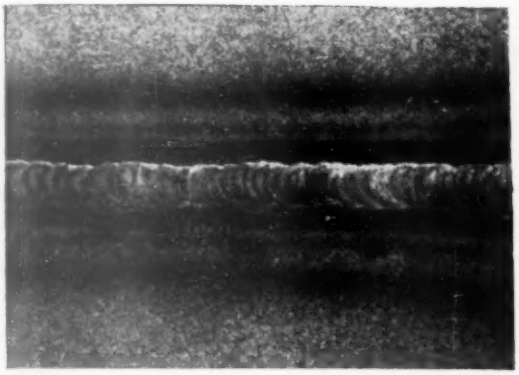
273 Ferris Avenue, White Plains, N. Y.

Weld Sheet Steel with the HELIARC torch

Trade-Mark



and wipe out one complete operation



AS WELDED — *This photograph, unretouched and natural size, shows that* HELIARC *welds in sheet steel are clean and uniform.*

There is no spatter or flux, so you save cleaning costs when you switch to the HELIARC process for welding sheet steel. And you keep the advantages of high speed, and minimum distortion that are characteristic of arc welding. Any manual arc or gas welding operator finds welding with a HELIARC torch easy to master.

Porosity-free welds in killed low-carbon steel up to $\frac{1}{8}$ in. thick can be made with this process. In non-killed grades, welds are as nearly gas free as can be produced by any welding process. Argon-shielding prevents pick-up of atmospheric gases. No argon is dissolved in the weld.

Joints welded with the HELIARC torch will not show under paint, lacquer, or even vitreous enamel finish. It takes only a light grinding to remove the low, smooth ripple and make the bead flush with the surface.

Get more information on this fast, clean, welding process from any LINDE office. Let us show you how it can improve your product and cut your costs. Just fill in the coupon.

The terms "Linde" and "Heliarc" are registered trade-marks of The Linde Air Products Company.

THE LINDE AIR PRODUCTS COMPANY
Unit of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada:
DOMINION OXYGEN COMPANY, LIMITED, Toronto

THE LINDE AIR PRODUCTS COMPANY
30 East 42nd Street, New York 17, N. Y.
(or your nearest LINDE office)

Gentlemen: We would like more information on welding sheet steel with the HELIARC torch. We manufacture ..... (Product)
from ..... (Metal) of ..... (Thickness)
We are ☐ (are not ☐) now using inert gas-shielded welding

Name.....Position.....

Company.....

City.....State.....

WELDING CATALOG SERVICE

Many welding equipment distributors realize the importance of placing their own catalogs in the hands of their regular and potential customers.

Photologue compiles the copy—also obtains an okay on the proof from the manufacturers of the products shown—prints the catalog by the photo off-set process. The catalogs are bound to suit the distributor's taste.

Write for samples and additional information.

Photologue Publishing Co.

CATALOG PUBLISHERS

600 W. JACKSON BLVD., CHICAGO 6, ILLINOIS

A welding arc as seen through a Shade No. 12 ordinary welding lens. Note . . . the glare and lack of visibility of the work.

PROOF POSITIVE

ARC GLARE IS ELIMINATED WITH

AGILE METALKLAD

Welding Filter Plates

A welding arc as seen through a Shade No. 12 METALKLAD WELDING LENS. Note . . . the absence of glare and the clear visibility.

42% MORE VISIBILITY

15-50% MORE EFFICIENCY

100% EYE PROTECTION

See your welding distributor for prices and literature or write to—

AGILE — ACTARC

For maximum efficiency, safety and production, equip the welding helmets of your welders with METALKLAD ARC WELDING FILTER PLATES. Available in any quantity or density. As different from ordinary welding lens as day from night. Mail the coupon for complete literature.

MAIL NOW

American Agile Corporation
5806 Hough Ave., Cleveland 3, Ohio

Gentlemen: Please send us complete Agile Metalklad Filter Plate literature and prices.

Name .....

Address .....

Title .....

City ..... State .....

AMERICAN AGILE CORPORATION

5806 HOUGH AVE. • CLEVELAND 3, OHIO

About People

P. L. EDMONDS has been transferred to the New England district office of Arcos Corp. in the Statler Building at Boston. He will be the field engineer in the Boston, Providence and Worcester areas.

• • •

J. F. HAWKINS has been appointed district sales manager of the Detroit territory of Page Steel and Wire Division of American Chain & Cable Co., Inc. He will handle the sale of welding electrodes, wire and chain link fence.

• • •

HENRY N. MULLER, JR., manager of the educational department of the Westinghouse Electric Corp., has been named assistant to the vice-president in charge of engineering. He will also continue to direct the educational department.

• • •

A. H. LOUX has been named manager of distributor sales for the Flexible Tubing Corp., Branford, Conn.

• • •

C. VICTOR MARS, former sales manager of the Ansul Chemical Company's Industrial Chemical Division, has been named manager of the company's new product department. ROBERT J. YAEGER succeeds Mr. Mars as industrial chemical sales manager.

• • •

W. C. SNYDER, JR., vice-president in the engineering and construction division of Koppers Company, Inc., has been assigned to manage the metallurgical department of that division. His assistant in the metallurgical work will be PETER V. MARTIN, as assistant manager.

• • •

CLAYTON D. GROVER, vice-president of the Whitehead Metal Products Co., Inc., a subsidiary of International Nickel, has been elected a director of the company.

• • •

WILLIAM E. MAHIN, director of research at Armour Research Foundation of Illinois Institute of Technology has been appointed a member of the National Research Council for a three year period.

• • •

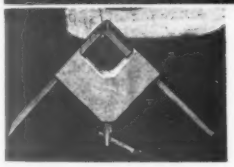
EDWARD PEARSON WARNER has been elected to receive the Daniel Guggenheim Medal and Certificate for 1950.

• • •

WALTER HULL ALDRIDGE has been elected to receive the John Fritz Medal for 1949. Mr. Aldridge has been president of the Texas Gulf Sulphur Company for more than 30 years, is a trustee of Columbia University and holder of the honorary degree of doctor of science.

Save
TIME & MONEY
WITH
THERMACOTE PRODUCTS
SPATTER-PROOF
COVER LENS
SAVE EYE STRAIN

THERMACOTE
KORNER-KLAMP
HOLDS 2 PIECES AT
EXACT 90° ANGLE



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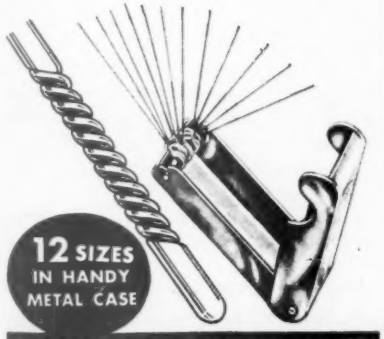
ITSELF
EVERY
TIME
USED

THERMO Spiral
TIP CLEANERS
NEW SPIRAL DESIGN
GUARANTEED
UNBREAKABLE



12 SIZES
IN HANDY
METAL CASE

THERMACOTE CO.
Newark, N. J. Chicago, Ill.
Los Angeles, Calif. Portland, Ore.

CLAYTON B. HERRICK, former editor of *Industry and Welding* magazine, has been named Ohio representative of the Reed Engineering Co., Carthage, Mo. Mr. Herrick has been with the welding industry since 1934 when he joined the Lincoln Electric Co.

* * *

MILTON O. LANGE, formerly special sales representative for Joseph T. Ryerson & Son, Inc., New York City, has been appointed manager of plate product sales for the Fitzgibbons Boiler Co., Inc., New York City.

* * *

KENNETH H. MAC WATT has been appointed director of engineering sales of L. O. Koven & Brother, Inc., Jersey City, N. J. He succeeds W. D. Birch who resigned.

* * *

DAVID C. MINTON, JR., assistant to the director of Battelle Institute, Columbus, O., has been named executive in charge of sponsor relations and projects development.

* * *

B. J. FLETCHER has been named assistant chief hydraulic engineer for Aluminum Company of America.

* * *

T. N. ARMSTRONG was scheduled to present a technical paper, "Behavior of Some Weld Metal at Sub-Zero Temperatures" before a meeting of the Petroleum Division of the American Society of Mechanical Engineers on Oct. 4 at the Oklahoma Biltmore Hotel, Oklahoma City, Okla. He is in charge of the Railway and Cast Steel Section of International Nickel Co. Development and Research Division.

Book Reviews

Pipe-Fitting

UNIVERSAL PIPE FITTERS' LAYOUT GUIDE, Second Edition. By John L. Matasovic. Published by Universal Welding Supply Co., Chicago, 1949. Paper, 4¼ x 5½ in.; 72 pages. Price $2.

To explain the various trignometric problems that face a pipe fitter in his everyday work, the author describes 23 possible combinations of problems in right-triangle trigonometry and gives diagrams to aid in finding the angles involved and the lengths of pipe needed. Tables of all six trignometric functions are included: sines, cosines, tangents, cotangents, secants and cosecants.

Such specific jobs as cutbacks for a miter of any desired angle on any pipe diameter, three-piece 90-deg turn, four-piece 90-deg turn, 67½-deg to 11¼-deg single pipe offset, equal spread 45-deg offset, etc., are pictured.

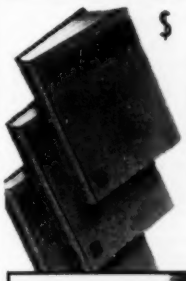
Other information includes a table of decimal equivalents, the length of arc subtended by any angle, formulas for the calculation of pipe bends and steel pipe data.

Mr. Matasovic, the author, is a member of the Pipe Fitters Association and was formerly an instructor in pipe fitting at Washburne Trade School in Chicago.

NEW Intensive 6 weeks course trains your men for *faster welding*

Cost saving methods, techniques and design are taught by experienced instructors in this NON PROFIT School.

Classes begin every Monday. Tuition is low. Approved under G. I. Bill. Check coupon for details on **The HOBART School of Welding.**



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How to redesign for ARC WELDING

These books show hundreds of designs to help make your product better, at lower cost. Price $3.50 each, or $10.00 complete set of 3 volumes. Order yours today.

HOBART No. 10—E6010
a faster electrode
for "all-position" welding

Try it. Comparison will prove you can get more top quality welding per day.

Hobart Electrodes are made for every application of A. C. and D. C. welding. Tell us the type work you do and we'll send samples for you to try out.

It pays to have standby A. C. Power for tools, lights—plus A. C. WELDING

This 200 Amp. welder is changed to 5 KW power plant by flipping a switch.

Handle routine jobs easier—be prepared for emergencies.

write to HOBART

Powered by a husky 4-cylinder gas engine. Portable if desired.

Save $300 to $500 "Build-Your-Own" Portable arc welder WITH THIS *LOW COST HOBART*

Generators without motors are made in all sizes. Choose A.C. or D.C. size you need. Hook to your own power source. Get details today.

HOBART BROTHERS CO., Box U-1191, Troy, Ohio

HOBART

"One of the world's largest builders of arc welders"

HOBART BROTHERS CO., Box U-1191, Troy, Ohio

Please send more information on HOBART items checked below:

- ☐ Hobart Trade School
- ☐ Practical Design for Arc Welding
- ☐ A.C. Welder—A.C. Power Unit
- ☐ Hobart Electrodes
- ☐ Generators to "Build-Your-Own"
- ☐ Hobart D.C. and A.C. Welders

Name_____

Firm_____

Address_____

WORLD FAMOUS

Low Temperature
EUTECTIC
WELDRODS

for every WELDING job

SOLVE your metal joining problems the easy EUTECTIC* way, and do every job better at less cost.

EUTECTIC LOW TEMPERATURE WELDING ALLOYS* are truly amazing in performance . . . reduce risks of burning, distortion and dangerous stresses . . . are faster, surer, safer.

EUTECTIC offers a large selection of specially designed alloys—over 100—that bond at surprisingly low, harmless heats. You'll find them splendid on any metal or combination of metals . . . *and simple to use with your arc machine or torch.*

WE'D LIKE TO HEAR YOU SAY: "O. K. EUTECTIC, PROVE IT!"

Naturally, it pays to have EUTECTIC on hand at all times . . . but on new problems, call OUR NEAREST FIELD MANAGER immediately for a FREE and enlightening CONSULTATION-DEMONSTRATION IN YOUR OWN PLANT. More than 200 Eutectic Field Engineers and Consultants, located across the nation, are at your service . . . see your local PHONE DIRECTORY or contact OUR MAIN OFFICE.

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HARD-FACING BY WELDING. By M. Riddihough. Published by Louis Cassier Co., Ltd., London, 1949. Cloth, 5½x8½ in.; 126 pages. Price $2.

"Hard-Facing Rods and Their Development" is the title of the opening chapter, in which the author discusses the first patent for hard-facing issued in 1896. He then brings the reader up to date while discussing the various hard-facing materials. Subsequent chapters cover such subjects as designing the deposit, design for specific jobs, pre-heating and cooling, jigs, technique, inspection, estimating and planning.

The basic idea of *Hard-Facing by Welding* is to enable the maintenance engineer called upon to hard-face a certain type of metal to tackle the job. It is intended as a practical manual and covers each stage of the process. The first volume devoted solely to the subject, it is an important contribution.

* * *

Tool Engineering

TOOL ENGINEERS HANDBOOK. Edited by Frank W. Wilson. Published by McGraw-Hill Book Co., Inc., New York, 1949. Cloth, 6x9 in., 2,070 pages. Price $15.

The American Society of Tool Engineers has sponsored the publication of an authoritative reference book of 115 chapters which covers every phase of mechanical manufacturing activities in which a tool engineer is required to make or influence decisions. This volume is the work of 152 authors and co-authors, each of whom is a recognized authority in his particular phase of tool engineering. As a further check on the authenticity of the included materials, the manuscript was checked by 125 reviewers.

In the handbook's 115 chapters, with some 2,000 illustrations, is presented basic factual data collected from responsible sources. It has been arranged in a manner suited to fast, easy usage for making tool engineering decisions. Such phases of tool engineering as design, planning, tool-up, operations, tooling and inspecting are thoroughly discussed. The decisions covered by the *Tool Engineers Handbook* include the investigation of new materials, tools, processes and methods; original research on new projects; economical selection of new materials, tools, processes and methods; analysis and improvement of setups and operations; improvement and standardization of planning and control.

Six chapters (95 pages) are devoted to welding and allied processes. This treatment covers: oxygen (flame) cutting; gas welding; arc welding; resistance welding; soft soldering and brazing. These particular chapters are concise and all-inclusive. In addition to giving specific welding information relating to tool engineering, there are also data on welding design, symbols, weldability of metals, joints and the economy of welding.

The *Tool Engineers Handbook* is a must for those engaged in tool engineering. This, the first, edition has been so well planned it is in reality a fully developed reference rather than the mere compilation of rudimentary data which is often found in first edition handbooks.

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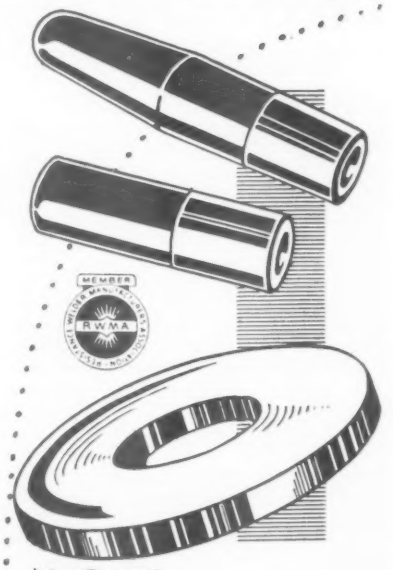

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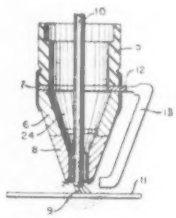
From the Patent Office

Arc Stabilizing Device

2,475,183. GLENN J. GIBSON, Chatham, N. J. Assigned to Air Reduction Co., Inc., New York City. Filed June 9, 1948. Granted July 5, 1949.

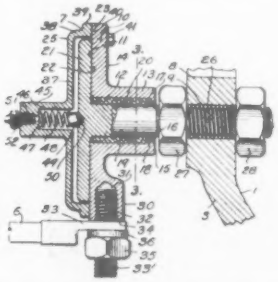


For stabilizing the arc in metal arc welding apparatus, a newly patented device has a magnet surrounding the electrode. A circular extension of paramagnetic material is in contact with the magnet terminating near the end of the electrode. This material has an opening through which the electrode projects. A pole (13 in above drawing), having one end in contact with the magnet extends to a specified distance from the end of the electrode to afford a magnetic flux field surrounding and directing the arc toward the pole.

* * *

Welding Ground Connector

2,475,051. GWYNNE RAYMOND., Oklahoma City, Okla. Assigned to Black, Sivalls & Bryson, Inc., Kansas City, Mo. Filed July 14, 1947. Granted July 5, 1949.



Patent pertains to a welding ground having disc-shaped electrically conductive members having their contact faces arranged in a plane across their axes. A spindle is coaxially connected with one of the conductive members and a hub extends coaxially of the other member, while rotatable on the spindle, to support the faces in the contact plane. Nuts on the spindle anchor it to a workpiece to be welded while the other conductive member is attached to the ground conductor. Spring means carried by one of the members maintains the face contacts.

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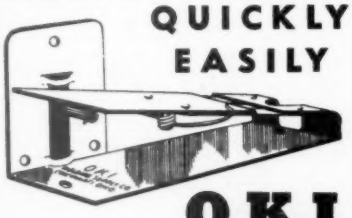

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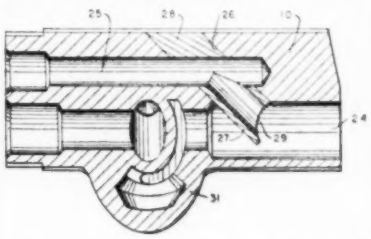
Cutting Torch

2,480,283. EDWIN R. BLAHUT, Hackensack, N. J. Assigned to Air Reduction Co., Inc., New York City. Filed April 8, 1948. Granted Aug. 30, 1949.

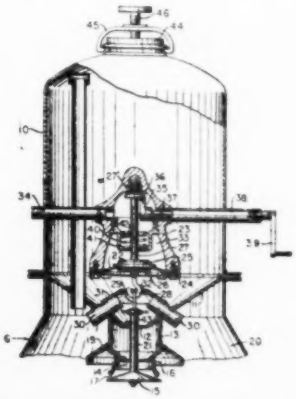


Patent pertains to a gas cutting torch in which a cutting oxygen passage in the torch controlled by a valve and supplied by an oxygen hose delivers cutting oxygen to the torch tip. A preheat-oxygen passage taps a quantity of oxygen from the cutting-oxygen passage at the upstream side of the valve. The tapped preheat oxygen goes into a fuel gas passage to a mixing zone where the combined mixture is fed to the preheating flames projected from the torch tip. Baffles project into the cutting-oxygen passage at a distance far enough downstream from the entrance to the preheat-oxygen passage to deflect into the preheat oxygen an amount of oxygen which is substantially constant whether the cutting-oxygen valve is open or closed.

* * *

Carbide Feed Mechanism

2,480,292. HARRY HOOPER, New York City. Assigned to Air Reduction Co., Inc., New York City. Filed April 7, 1948. Granted Aug. 30, 1949.



Patent pertains to a carbide-to-water acetylene generator in which a movable element controls the delivery of carbide from the hopper to the water. A diaphragm controls the movement of the feed mechanism by being exposed at one side to the pressure of the acetylene being generated. A gas loading chamber is at the other side of the diaphragm. A source of compressed gas independent of the acetylene produced in the generator is delivered at a constant predetermined pressure to the loading chamber.

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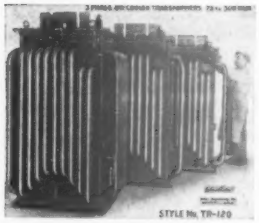

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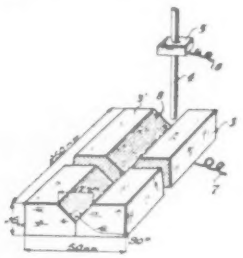
Arc Welding Method

2,475,835. THEODORUS HEHENKAMP, Eindhoven, Netherlands. Assigned to Hartford National Bank & Trust Co., Hartford, Conn. Filed Sept. 5, 1945. In the Netherlands, Sept. 3, 1943. Granted July 12, 1949.

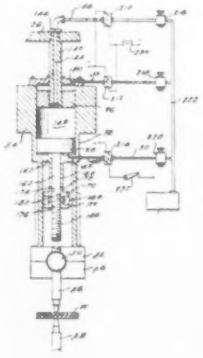


Patent pertains to a method of automatic arc welding which includes placing a layer of slag-forming material on the workpieces to be welded. The melting tip of the welding wire is kept in the material. In response to the temperature of the welding wire at a point near the melting tip, the distance between the tip and the point of current supply is automatically varied. This maintains the Joule effect of the welding current in the wire to a value at which the speed of welding is at least 1.2 times greater than the specific welding speed as the intensity of the welding current remains unchanged.

* * *

R-W Pressure Mechanism

2,476,187. JOHN D. GORDON, Pleasant Ridge, Mich. Assigned to Progressive Welder Co., Detroit. Filed Feb. 27, 1946. Granted July 12, 1949.



Patent pertains to a welding ram in which one member carries a welding electrode. This member has a cylinder with two end walls and a piston within each section to form two pressure chambers. The second piston is attached to the first for limiting the movement of the member in one direction. This is managed since the first end wall has an aperture in it through which a supporting member extends into the cylinder. The first piston is fastened to the first end wall and when fluid pressure is applied the member moves in one direction. When a certain fluid pressure is applied to the second pressure chamber for moving the second piston towards the first, the movement of the member is thereby limited.

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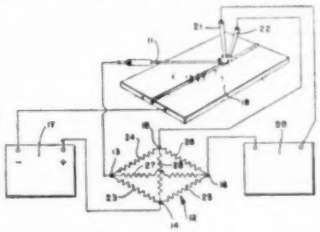
Multiarc Welding Apparatus

2,478,985. COLBY WESTON STEWARD, Kenmore, and MALCOLM R. RIVENBURGH, Williamsville, N. Y. Assigned by mesne assignments to Cornell Aeronautical Laboratory, Inc., Buffalo, N. Y. Filed March 29, 1947. Granted Aug. 16, 1949.

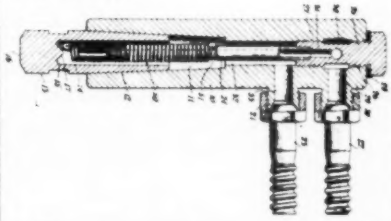


A newly patented arc welding apparatus includes a pair of carbon electrodes using alternating current and a metallic electrode using direct current. The carbon electrodes form a heating arc near the workpiece after which the welding is carried out by the metallic electrode, as shown in the above drawing.

* * *

R-W Electrode Holder

2,475,209. NORMAN ALBERT TUCKER, London, England. Assigned to P. R. Mallory & Co., Inc. Filed June 3, 1947. In Great Britain, July 24, 1945. Granted July 5, 1949.

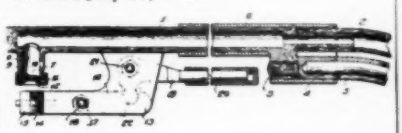


This patent pertains to an electrode holder having a longitudinal passage in it and a socket for holding a welding tip. A cooling fluid conduit extends through the passage with one end positioned next to the socket. A helical spring is mounted on the end of the conduit so that it acts as a deformable extension of the conduit.

* * *

Gas-Electric Cutting Torch

2,475,594. FRANCOIS GEORGES DANHIER, Shaerbeek, Belgium. Assigned to La Soudure Electrique Autogene Societe Anonyme, Brussels, Belgium. Filed June 4, 1945. In Belgium, Jan. 19, 1945. Granted July 12, 1949.



Patent pertains to a torch for gas-electric cutting and welding. The holder body has an interior passage which is connected to a gas supply. A push connection to this passage is adapted to receive an electrode. Jaws in line with the push connection receive electric current and are locked by a lever to hold the electrode in position.

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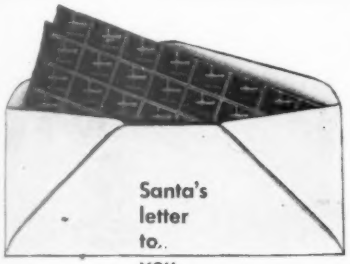
Welding Alloys Manufacturing Co.

744 Broad St., Newark 2, N. J.



Answer the *once-a-year* Christmas Seal letter . . . and you make possible the *year-round* giving of health, life itself.

Your contribution will support the research, education, case-finding, and rehabilitation programs of the National Tuberculosis Association and its affiliates – which since 1904 have helped to spare almost 5,000,000 lives. Yet, TB still kills more people between the ages of 15 and 34 than any other disease.

So, please, as part of your giving this year, remember Christmas Seals.

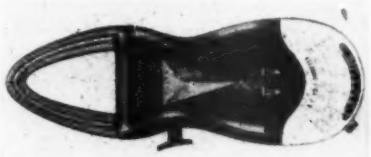
Answer the letter that saves lives – send in your contribution, today.

BUY CHRISTMAS SEALS

Because of the importance of the above message, this space has been contributed by **THE WELDING ENGINEER**

NEW PRODUCTS

(Continued from page 46)



PLASTIC finger trigger opens transformer probes and clamps around conductor to measure current in new split-core volt-ammeter

Volt-Ammeter

NEW pocket-type split-core volt-ammeter called "Amprobe" measures current without interrupting service. For measuring voltage, a pair of test leads are inserted into the front-mounted pin jacks and connected to the line.

Measurements of the instrument are 7⅛ in. long by 2 9/16 in. wide by 1⅛ in. thick. The case and scale window are molded as one piece in lucite plastic. Scale length is 2.47 in.

Completely insulated, no metal parts come in contact with the operator. Transformer probe jaws are insulated with a 1/16 in. cover of molded nylon. The "Amprobe" is available in two models, each with seven ranges. Model A-5 is 6.5/13/26/65/130 amps and 130/260 volts. Model A-6 is 10/25/50/198/250 amps and 150/600 volts. PYRAMID INSTRUMENT CO., 49 Howard St., New York City.

* * *

Pipe-Threading Machine

OPERATING benefits obtained from the "Thred-O-Matic 44" pipe threading machine include faster working speed and automatic chucking. The operator is required only to lay pipe in the spindle, flip a switch and the pipe is chucked, centered and turning. Only an occasional resharpening of the 8 jaws, 4 front and 4 rear, is required. Chuck jaws are hobbed like pipe-wrench jaws; the more torque applied to the pipe, the firmer the gripping power. The machine is able to handle pipe from ½ to 4 in. diameter. QUIJADA TOOL CO., 5474 Alhambra Ave., Los Angeles, Calif.

* * *

Contact Electrode

NEW a-c/d-c electrode for high-speed welding is pressed directly against the metal and drawn straight along the joint. Called "Eutec-Hand-Omatic," the electrode is claimed to weld thin sheet with little risk of burning through and with greatly increased speed. The slag left after welding "Eutec-Hand-Omatic" comes in three types; No. I for all-position welding, No. II for flat and horizontal fillets and No. III for underwater use.

Weld deposit is said to have a tensile strength of 70-80,000 psi. Electrode sizes available according to type are: No. 1, 1/32, ⅛ and 5/32 in.; No. II and III, ⅛ and 5/32 in. EUTECTIC WELDING ALLOYS CORP., 40 Worth St., New York City, 13.

"Don't Gamble!"

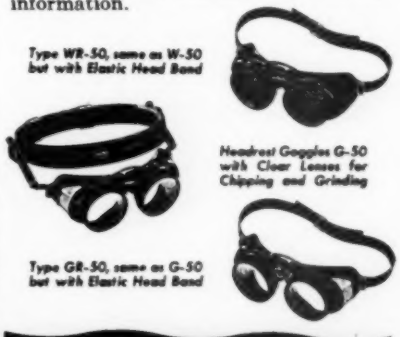
Eye injuries amount to about one-third of industrial accidents. Yet with proper precautions 90% of these can be prevented. All too many seem to be gambling on their good luck—and with disastrous results. Far better to follow the recommendations of safety experts and choose the right protection for each job.

For Gas Welding, Cutting, and Brazing, Jackson Headrest Goggles type W-50 are light and easy to wear, with or without prescription glasses, are simple and easy to adjust, easy to raise and lower.

Goggle assembly is hinged from headrest with telescopic arms, held gently against the face by concealed springs. Spring clips hold arms to headrest to provide added adjustment and easy replacement. Headrest of light, easy to clean plastic, adjustable for size.

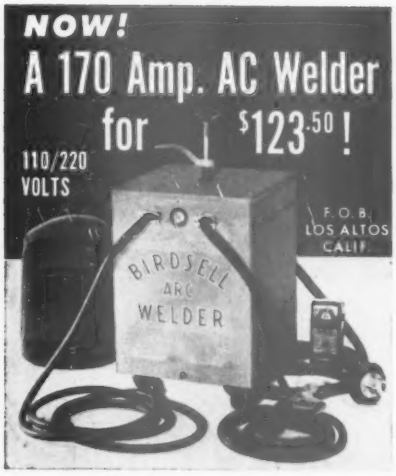
Plastic eye cups easily fitted to the face. Outside of each cup has ventilating screen to prevent fogging and baffle plate to keep flying particles and light rays out. 50 mm. glass lenses are available in standard shades from 3 through 6, and have cover glasses to protect them.

Sold only by distributors and dealers in the U.S. and Canada. Write us for information.


Type WR-50, same as W-50 but with Elastic Head Band
Headrest Goggles G-50 with Clear Lenses for Chipping and Grinding
Type GR-50, same as G-50 but with Elastic Head Band

SAFETY GOGGLES · SPECTACLES · EYESHIELDS

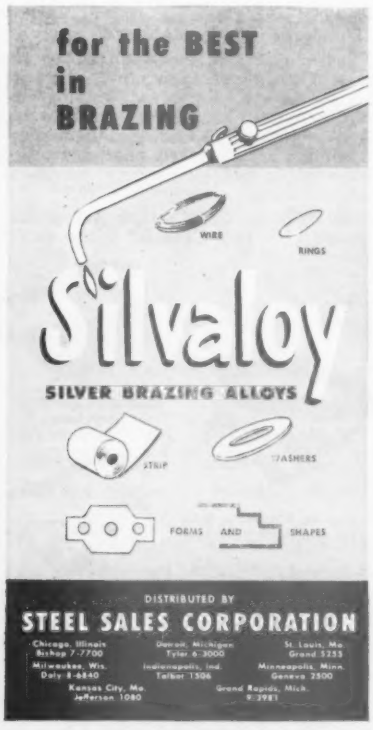
JACKSON
PRODUCTS
WARREN · MICHIGAN



1. Over 25,000 in use—U. L. approved.
2. Handles from 1/16" to 5/32" rod.
3. Stepless control from 10 to 170 amps.
4. Portable, weight 100 lbs.
5. Complete with accessories, ready to weld.
6. One year unconditional guarantee.
7. Attractive discounts — distributorships open.

• INQUIRIES INVITED

BIRDSELL MANUFACTURING CO. INC.
P. O. Box 733 - Los Altos, Calif.



Torch Lighter

A THREE-FLINT torch lighter made from tin-coated flat spring steel is claimed to hold the flints firmly against the file. A square cap surrounds the file, protecting it from dirt and damage and also forming a large holding pocket for gas to insure quick lighting.

The three flints are mounted on a flat, triangular holder integral with the lighter. When one flint is worn out the holder is rotated to provide a fresh flint. Flint renewal units are packaged in envelopes and are available separately.

BURDETT OXYGEN CO., 330 Lakeside Ave., Cleveland.

* * *

Steel Work Bench

DESIGNED for heavy industrial and shop work, a new streamlined steel bench has a 12-gauge top. It is 6 ft. long, 34 in. high and 28 in. deep. Small lathes, grinders, presses, etc., can be attached to edge of bench. Standard finish is olive green enamel with any other colors optional, at slight extra cost. EQUIPTO, DIVISION OF AURORA EQUIPMENT CO., Aurora, Ill.

NEW PRODUCT BRIEFS

Roller Conveyor top on a portable elevating table aids movement of heavy loads to and from the table. Conveyor top fits over the table surface. A wedge, placed between rollers at each end of the load, prevents load from slipping during transit. THE HAMILTON TOOL CO., Hanover at Ninth, Hamilton, O.

* * *

Portable metal-cutting band saw cuts angles, bar, tubes and pipe up to a capacity of 6 by 10 in. Four cutting speeds, from 53 to 266 fpm, are available. MACHINE TOOL DIVISION, KALAMAZOO TANK & SILO CO., Kalamazoo, Mich.

* * *

Rubber-insulated clips, clamps and fasteners for securing welding cables, lines, piping and rods come in a variety of shapes. Exposed metal ends can be parkerized, zinc or cadmium plated, lacquered or enameled. AUTOMOTIVE RUBBER CO., 8601 Epworth Blvd., Detroit 4.

* * *

Eye-sweep for removing foreign particles from the eye has a magnet on one end and a wire loop on the other for non-magnetic particles. Each end is protected by a screw-on cap and a clip is provided for carrying convenience. GENERAL SCIENTIFIC EQUIPMENT CO., 2700 West Huntingdon St., Philadelphia 32, Pa.

* * *

Heavy-duty steel shelving is assembled with a single stud which slips into a keyhole on the uprights. The heavier the load, the tighter the grip. EQUIPTO DIVISION, AURORA EQUIPMENT CO., Aurora, Ill.

WHERE TO BUY SECTION

Featuring additional Equipment, Materials, Supplies & Services for the Welding Industry

6714 Bryn Mawr Ave.

A Good Habit

This "Where to Buy" Section supplements other advertising in this magazine.

It's a good habit to check this section—every issue.

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By J. A. Gerardi, Secretary.

Sworn to and subscribed before me this 20th day of September, 1949.

[SEAL] ELVA G. MASLIN
(My commission expires March 30, 1950.)